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HISTORY

OF

THE MAMMALIA.

VOL. III.

ORDER—PACHYDERMATA,

TERRESTRIAL AND AQUATIC;

ORDER—CETACEA; AND THE PHOCIDÆ.

WITH NUMEROUS ILLUSTRATIONS.

IN SIX VOLUMES.

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CONTENTS OF VOL. III.

ORDER—PACHYDERMATA.

	Page
The Hippopotamus	6
The Rhinoceros	15
The Indian Rhinoceros	22
The Javanese Rhinoceros	24
The Sumatran Rhinoceros	28
The Black or Common African Rhinoceros	30
The Keitloa	39
The White or Blunt-nosed Rhinoceros	40
The Daman, or Hyrax	45
The Cape Hyrax, or Dassie of the Colonists	48
The Syrian Hyrax	49
Genus Tapirus	50
The Common American Tapir	52
The Malay or Indian Tapir	56

FAMILY—SUIDÆ.

The Collared Peccary	59
The Babiroussa	63
The Wild Hog	67
The Domestic Hog	78
Genus Phacochoerus	83
The South African Phacochoere	85
The Abyssinian Phacochoere	89

EXTINCT FOSSIL SPECIES.

Skull of the Fossil Adapis	90
The Mastodon	91
The Palæotherium	95

	Page
The Lophiodon	100
The Anoplotherium	102
The Dinotherium	104
Fossil Skull of Toxodon	111

TRIBE—AQUATIC PACHYDERMATA.

The Dugong	132
The Manatee, or Lamantin	133
Zeuglodon	135

ORDER—CETACEA.

FAMILY—DELPHINIDÆ.

The Common Porpoise	141
The Narwhal	144
The Beluga	149

FAMILY—CATODONTIDÆ.

The Common Cachalot, or Spermaceti Whale	151
--	-----

FAMILY—BALÆNIDÆ.

The Greenland Whale, or Great Mysticete	162
The Rorqual	168

FAMILY—PHOCIDÆ.

The Common Seal	174
The Harp-Seal	180
The Sea-Leopard	182
The Crested Seal	184
The Elephant-Seal	187
The Ursine Seal	192
Forster's Sea-Lion	195
The Walrus, or Morse	199

SKETCH

OF THE

HISTORY OF THE MAMMALIA.

ORDER—PACHYDERMATA.

THE term Pachydermata was given to the present order by Cuvier, and refers to the thickness of the hide so generally conspicuous in the animals it comprehends; such, for example, as the elephant, hippopotamus, rhinoceros, hog, &c.

On looking at the order Pachydermata as a whole, we find it for the most part composed of genera between which there is a want of that intimate relationship which gives us an idea of unity or completeness. We see chasms in the gradation of existing forms, and are forced, as it were, by abrupt transitions from one genus to another, instead of passing through an intermediate series. Yet we are not rashly to infer the original plan and purpose of nature to have been destitute of unity. Far from it: happily the researches of the geologist have brought to light the fossil relics of many species, the extinction of which at some remote epoch has left blanks in the series—blanks, however, which we are thus enabled to fill up. And as these researches are continued and extended, we have reason to conclude that every hiatus caused by the absence of intermediate forms will become occupied. In the present order, indeed, the fossil relics of extinct species are peculiarly valuable and

interesting: among them are found not only the fossil remains of animals allied to existing species, as the fossil elephant or mammoth, fossil rhinoceroses, and others, but also of animals which have now no living representatives, and which constitute the types of distinct genera, comprehending exclusively beings whose characters are to be drawn only from their recovered relics, they themselves having been long blotted out from among the "things that be." Such are the Mastodon, the Anoplotherium, the Palæotherium, the Toxodon, the Dinotherium, and many more.

The order Pachydermata is divided by Cuvier into three sections: the first (Proboscideans) includes the elephants and the extinct Mastodon; the second (ordinary Pachyderms), the hippopotamus, tapir, rhinoceros, and hog,—the Anaplotherium, Palæotherium, and many other extinct forms; the third (the solidungulous Pachyderms) includes the horse and ass. To these we may add a fourth, namely, the aquatic, represented by the Dugong, Lamantin, &c.

The sketch of the Pachydermata would properly commence with the Elephant, but to that animal a volume has been devoted, and we therefore begin here with the Hippopotamus.

THE HIPPOPOTAMUS.

M. Desmoulins, from an examination of the skulls and skeletons of hippopotami from Senegal and from South Africa, considers that there are two distinct species, which he names respectively *H. Senegalensis* and *H. Capensis*. Very probably M. Desmoulins is correct, but as the habits of both species are precisely the same, and as the distinctive characters are founded on osteological minutiae only, we shall not treat them as different, more especially as the point is rather assumed than absolutely proved.

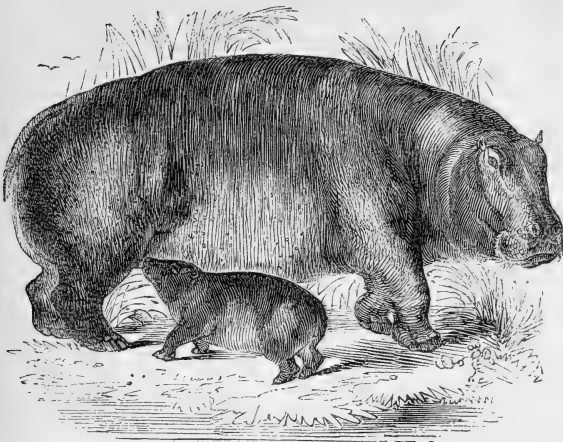
The hippopotamus is a native exclusively of Africa, where, though much more limited than formerly in the range of its habitat, it tenants the banks and beds of the larger rivers, and of the inland lakes from the Gariep to

the upper Nile and its tributary branches. It is, however, not restricted to these, for it is marine as well as fluviatile; and Dr. Smith thinks it difficult to decide whether it gives preference to the river or the sea for its abode during the day. When the opportunity of choosing the sea or the river existed, he found that some selected the one, and some the other.

Scarcely, if at all, inferior to the elephant in bulk, but much lower in stature from the shortness of the limbs, this massive animal presents us with the "ne plus ultra" of uncouth clumsiness and heavy solidity. Its body, like an enormous barrel supported on four thick pillars, almost touches the ground; the head is ponderous; the muzzle is swollen; and the great thick lips, studded with wire-like bristles, entirely conceal the projecting incisors of the lower jaw, and the huge curved tusks or canines; the mouth is wide; the nostrils open on the top of the swollen muzzle; and the eyes, which are very small, are situated high on the head; hence, when in the water, the animal by raising merely a small upper section of the head above the surface can both look around and breathe, the body remaining submerged. The ears are small and pointed; the tail is short, and furnished with a few wiry bristles. The toes, four on each foot, are tipped with small hoofs. The hide is naked, coarse, and of great thickness, being two inches deep or more on the back and sides. It is made into shields, whips, walking-sticks, &c. The whips known in Egypt under the name of korbadj are made of its skin, and form an important article of trade with the Senaar and Darfour caravans. "After being taken off, the skin is cut into narrow strips, five or six feet long, and gradually tapering to a point; each strip is then rolled up so that the edges unite and form a pipe, in which state they are tied fast, and left to dry in the sun. To render them pliable, they must be rubbed with butter or grease. In Egypt, where they are in general use, and the dread of every servant and peasant, they cost from half a dollar to a dollar each. In colder climates, even in Syria, they become brittle, crack, and lose their elasticity."

Between the skin and the flesh is a layer of fat, which is salted and eaten as a delicacy by the Dutch colonists of Southern Africa; indeed the epicures of Cape-Town, as Dr. Smith says, do not disdain to use their influence with the country farmers to obtain a preference in the matter of *sea-cow's speck*, as this fat is termed when salted and dried. The flesh also is excellent and in much request. The general colour of the hippopotamus is dusky brownish red, passing on the sides and limbs into a light purple, red, or brown; the under parts, the lips, and the eyelids are light wood-brown, with a tinge of flesh-colour; the hinder quarters and the under surface are freckled with spots of dusky brown; the hairs of the tail and ears are black, those on the muzzle yellowish-brown. The male far exceeds the female in size. The hippopotamus is gregarious in its habits, sagacious, wary, and cautious. It has been long driven away from the rivers within the limits of the Cape colony; but in remoter districts, where the sound of the musket is seldom heard, it abounds in every large river, and is comparatively fearless of man. "To convey," says Dr. Smith, "some idea of the numbers in which they were found in several of the rivers towards the tropic of Capricorn, it may suffice to state that in the course of an hour and a half a few members of the expedition party killed seven within gunshot of their encampment. Several other individuals were in the same pool, and might also have been killed, had it been desirable. One of the survivors was observed to make his escape to an adjoining pool, and in accomplishing that he walked with considerable rapidity along the bottom of the river, and with his back covered with about a foot of water." (Fig. 1.)

The hippopotami, according to Dr. Smith, feed chiefly on grass, resorting to situations near the banks of rivers which supply that food. "In districts fully inhabited by man," says Dr. Smith, "they generally pass the day in the water, and seek their nourishment during the night; but in localities differently circumstanced they often pass a portion of the day as well as the night upon dry land. In countries in which the night-time



1.—Female Hippopotamus and Young.

constitutes the only safe period for their leaving the water, they are generally to be seen effecting their escape from it immediately before dark, or are to be heard doing so soon after the day has closed, and according to the state of the surrounding country; they then either directly commence feeding, or begin a journey towards localities where food may exist. When previous to nightfall they may have been in pools or rivers, they are generally at once enabled to commence feeding on reaching the dry land; but when they may have passed the day in the sea, they require commonly to proceed some distance after leaving it, before they find the grass which appears congenial to their palate. It is not every description of grass that hippopotami seem to relish: they often pass over, in search of food, luxuriant green swards, which would strongly attract many other animals which feed upon grass. Besides having a peculiar relish for the grasses of certain situations, they appear to have a predilection for districts supporting brushwood; and,

owing to the latter peculiarity, they are often to be found wandering in localities on which but little grass exists, when they might have it in the neighbourhood in great abundance, but without the accompaniment of wood."

We learn from Mr. Salt, that in the district of Abyssinia watered by the Tacazze, a tributary to the Nile, hippopotami are very numerous. The Abyssinians term the animal Gomari. As Mr. Salt travelled along the line of the river, he found it interrupted by frequent overfalls and shallow fords. Between these shallows are holes or pits of vast depth, resembling the lochs and tarns in the mountain districts of Scotland and England. It is to these depths that the hippopotami delight to resort; and here Mr. Salt and his companions observed their actions, which he compares to the rolling of a grampus in the sea.

"It appears," observes the same traveller, "from what we have witnessed, that the hippopotamus cannot remain more than five or six minutes at a time under water, being obliged to come up to the surface at some such interval for the purpose of respiration."

It has generally been asserted that this huge, powerful, and, it should seem, inoffensive animal has no enemy in the brute creation audacious enough to contend with it. Some travellers, however, have attributed this boldness to the crocodile, describing combats between them, which in truth never take place, no enmity subsisting between the two animals. While Mr. Salt and his party were engaged shooting at the hippopotami, they frequently observed several crocodiles of an enormous size rise together to the surface of the same stream, apparently regardless of and disregarded by their still more enormous neighbours. Captain Tuckey, in his expedition to explore the Zaire or Congo, observed immense numbers of hippopotami and alligators in the same water—an association inconsistent with hostility.

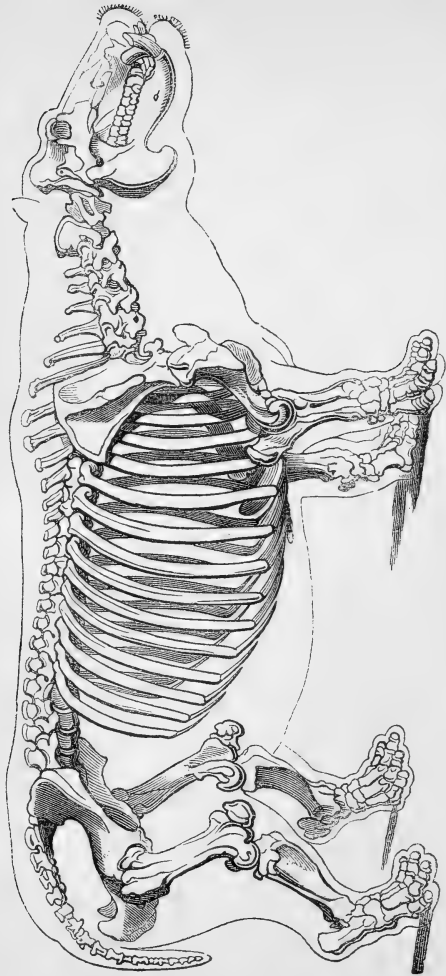
Burckhardt (see his 'Travels in Nubia') informs us that lower down the Nile, in Dongola, where there are neither elephants nor rhinoceroses, the hippopotamus is very common. The Arabic name for it is Barnik. It

is a dreadful scourge to the inhabitants, who lack the means of destroying it. Occasionally, but rarely, it is seen much farther north, even below the cataract of the Nile at Assouan.

The hippopotamus abounds in the Niger, where it was seen by Richard and John Lander. Clapperton observed them in the lake Muggaby, Bornou, and in the great lake Tchad and its tributary rivers.

Quiet and inoffensive, it is only when attacked that the hippopotamus becomes furious, and if hard pressed on land he rushes open-mouthed with the utmost desperation on his aggressor. If the party attacking the animal in his watery domicile be in a boat, their danger is extreme. Captain Owen ('Narrative of Voyages to explore the Shores of Africa, under Captain W. F. W. Owen') had many encounters with these animals. While examining a branch of the Temby river, in Delagoa Bay, a violent shock was suddenly felt from underneath the boat, and "in another moment a monstrous hippopotamus reared itself up from the water, and in a most ferocious and menacing attitude rushed open-mouthed at the boat, and with one grasp of its tremendous jaws seized and tore seven planks from her side; the creature disappeared for a few seconds, and then rose again, apparently intending to repeat the attack, but was fortunately deterred by the contents of a musket discharged in its face. The boat rapidly filled, but, as she was not more than an oar's length from the shore, they (the crew) succeeded in reaching it before she sank. The keel, in all probability, had touched the back of the animal, which, irritating him, occasioned this furious attack; and, had he got his upper jaw above the gunwale, the whole broadside must have been torn out. The force of the shock from beneath, previously to the attack, was so violent, that her stern was almost lifted out of the water, and Mr. Tambs, the midshipman steering, was thrown overboard, but fortunately rescued before the irritated animal could seize him.

Fig. 2 represents the skeleton of the hippopotamus, which is a ponderous frame-work in unison with the



2.—Skeleton of Hippopotamus.

vast weight of solid flesh to be sustained and the enormous strength of the muscles. The neck, though short, is longer in proportion than that of the elephant, and from the shortness of the limbs gives the animal the power of grazing the herbage.

The following account of the mode of attacking the hippopotamus in Dongola is from 'Travels in Nubia,' by Dr. Edward Rüppell, a careful observer and a trustworthy writer. Dongola is a narrow slip of country lying on both sides of the Nile, and extending southward from $19^{\circ} 43'$ of north latitude for about 170 miles, measured along the course of the stream:—

“The harpoon with which the natives attack the hippopotamus terminates in a flat oval-shaped piece of iron, three-fourths of the outer rim of which are sharpened to a very fine edge. To the upper part of this iron one end of a long stout cord is fastened, and the other is tied to a thick piece of light wood. The hunters attack the animal either by day or by night, but they prefer daylight, as it enables them better to escape from the assaults of their furious enemy. One part of the rope with the shaft of the harpoon the hunter takes in his right hand; in the left he holds the rest of the rope and the piece of wood. Thus armed, he cautiously approaches the animal when he is asleep during the day on some small island in the river, or he looks for him at night, when the hippopotamus is likely to come out of the water to graze in the corn-fields. When the huntsman is about seven paces from the beast, he throws the spear with all his might, and if he is a good marksman the iron pierces through the thick hide, burying itself in the flesh deeper than the barbed point. The animal generally plunges into the water; and though the shaft of the harpoon may be broken, the piece of wood that is attached to the iron floats on the surface, and shows what direction he takes. There is great danger if the hippopotamus spies the huntsman before he can throw his spear. He then springs forward with the utmost fury, and crushes him at once in his wide open mouth; an instance of which took place while we were in the country.

“As soon as the animal is fairly struck, the huntsmen in their small canoes cautiously approach the floating wood, and, after fastening a strong rope to it, they hasten with the other end towards the large boat, which contains their companions. The huntsmen now pull the rope, when the monster, irritated by the pain, seizes the boat with his teeth, and sometimes succeeds in crushing or overturning it. In the mean time his assailants are not idle: four or five more harpoons are plunged into him, and every effort is made to drag the beast close up to the boat, so as to give him less room to plunge about in. Then they try to divide the *ligamentum nuchæ** with a sharp weapon, or to pierce his skull. Since the body of a full-grown hippopotamus is too bulky to be pulled out of the water without a great number of hands, they generally cut him up in the water and bring the pieces to land. In the province of Dongola not more than one or two of these animals are killed in a year: from 1821 to 1823 inclusive, nine were killed, out of which number we despatched four. The flesh of a young hippopotamus is very good; but the full-grown ones are generally too fat. They weigh as much as four or five oxen. The hide is made into excellent whips, and will furnish from 350 to 500. No use is made of the teeth.

“One of the hippopotami which we killed was a very old fellow, and of an enormous size, measuring $13\frac{1}{2}$ French feet from the nose to the extremity of the tail. His incisive teeth were 26 French inches long, measured from the root to the point, along the outer bending. We fought with him for four good hours by night, and were very near losing our large boat, and probably our lives too, owing to the fury of the animal. As soon as he spied the huntsmen in the small canoe, whose business it was to fasten the long rope to the float, he dashed

* The suspensory ligament (an elastic substance), which holds the heads of quadrupeds in their places, so as to allow a free movement downwards, is particularly strong in all those whose heads are of great weight.

at them with all his might, dragged the canoe with him under the water, and smashed it to pieces. The two huntsmen with difficulty escaped. Of twenty-five musket-balls aimed at the head from a distance of about five feet, only one pierced the skin and the bones of the nose : at each snorting the animal spouted out large streams of blood on the boat. The rest of the balls stuck in the thick hide. At last we availed ourselves of a swivel ; but it was not till we had discharged five balls from it at the distance of a few feet, and had done most terrible damage to the head and body, that the colossus gave up the ghost. The darkness of the night increased the danger of the contest, for this gigantic animal tossed our boat about in the stream at his pleasure ; and it was at a fortunate moment indeed for us that he gave up the struggle, as he had carried us into a complete labyrinth of rocks, which, in the midst of the confusion, none of our crew had observed.

“For want of proper weapons the natives cannot kill a hippopotamus of this size : all they can do to drive him from their fields is to make a little noise in the night, and to keep up fires at different spots. These animals, from their voracity, are a curse to a whole district ; and in some places they are so bold that they will not quit the fields which they are laying waste till a great number of men come out with poles and loud cries to attempt to drive them away.”

Four fossil species of hippopotamus are described by Cuvier ; of one (*H. antiquus*) the relics are widely distributed, and are particularly abundant in the Val d’Arno, Italy, intermixed with those of the elephant and rhinoceros.

THE RHINOCEROS.

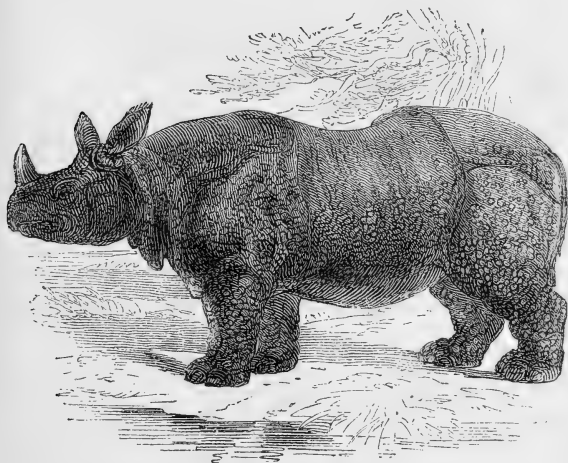
This genus contains six living and well-established species, as far as naturalists are at present able to determine, and several fossil species, of which the relics occur in the same strata as those of the fossil elephant.

The existing species are confined to the hotter regions of the Old World, and are divided between Africa and



3.—Rhinoceros.

India, including the islands of Java and Sumatra. It is in the land of the elephant and the hippopotamus that the rhinoceros wanders in fearless confidence, as if aware of his enormous powers and the advantage of his weapons of defence. One species (*Rh. Indicus*: Figs. 3, 4, 5, and 7) is peculiar to continental India beyond the Ganges, Siam, and Cochin-China; one (*Rh. Java-nus*: Fig. 8) is a native of Java; and one with two horns (*Rh. Sumatranus*: Fig. 10), of Sumatra. Three two-horned species are indigenous in Africa, viz. the common two-horned or black rhinoceros (*Rh. bicornis*, Linn.; *Rh. Africanus*, Cuv.: Figs. 11 and 12); the white rhinoceros (*Rh. simus*: Figs. 14 and 15); and the keitloa (*Rh. Keitloa*: Fig. 13), discovered by Dr. Smith during his expedition into the interior. We may here add that, though Bruce and Salt notice the existence



4.—Indian Rhinoceros.



5.—Indian Rhinoceros.

of a two-horned rhinoceros in Abyssinia different from the common species of South Africa,* there is some

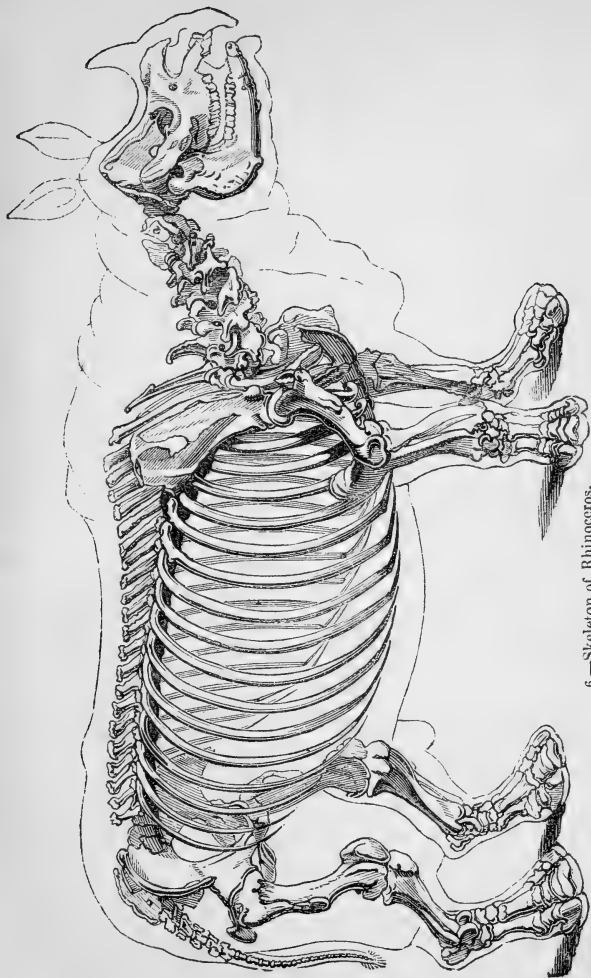
* A pair of horns brought by Salt from Abyssinia, and now in the museum of the Royal College of Surgeons, more nearly resemble those of the keitloa than of the *Rh. bicornis*; and Dr. Smith considers a pair brought by Major Denham from North Africa to be different again, and unlike those of any other species. Clubs of rhinoceros-horn, of about three feet in length, have been brought from Dahomy, Western Africa. It is evident that there are two or three species in Africa with which naturalists are not acquainted.

reason to believe in the existence of a single-horned species in that region. Bruce states that a one-horned rhinoceros is found towards Cape Gardafui, according to the accounts of the natives in the kingdom of Adel. Accounts of such an animal were received by Dr. Smith from the natives in the interior of South Africa, who represented it as living far up the country; moreover Burckhardt alludes to a one-horned species in the territory above Sennaar, and states that the inhabitants there give it the name of the "mother of the one horn." According to this traveller, its northern boundary, like that of the elephant, is the range of mountains to the north of Abou Huaze, two days' journey from Sennaar. The hide of this animal is manufactured into shields, which have an extensive sale; the material of the horn is also sold, and at a high price, Burckhardt having seen four or five Spanish dollars paid for a piece four inches long and one inch thick. Was the one-horned rhinoceros seen by Strabo at Alexandria this species or the common Indian?—and the same question applies to the one-horned rhinoceros, which, with a hippopotamus, was given by Augustus, in the celebration of his triumph over Cleopatra, to be slain in the Circus; which animals, Dion Cassius says, were then first seen and killed at Rome—an assertion perfectly erroneous as it respects the rhinoceros, if it was the common Indian species, for Pliny, in his eighth book, alluding to the games of Pompey, mentions the one-horned rhinoceros (Indian, it is presumed) as then exhibited ("Iisdem ludis, et rhinoceros unius in nare cornu, qualis sæpè visus"). With respect to the two-horned African species, it was also exhibited in Rome; and had learned critics known anything of natural history, the line in Martial ("namque gravem *gemino cornu* sic extulit *ursum*") would not have given rise to so many futile disquisitions and attempted corrections. Pausanias describes a two-horned rhinoceros under the name of Æthiopian Bull. Two individuals of the same species appeared at Rome under the Emperor Domitian, on some of whose medals was impressed their figure; others were exhibited under

Antoninus, Heliogabalus, and Gordian III. Martial lived in the time of Domitian, and the rhinoceros "*gemino cornu*" was doubtless seen by him.

The animals of the present genus are all remarkable for the massiveness of their form and the clumsiness of their proportions; they are, however, more prompt and rapid than might be at first supposed, and when attacked they rush on their foes with headlong impetuosity. The body is of great bulk, and protuberant at the sides; the neck is short and deep; the shoulders are heavy, the limbs thick; the feet are divided into three toes encased in hoofs. The skin is thick and coarse, with a knotty or tuberculous surface, and destitute, or nearly so, of hairs. In the common Indian species it is disposed in large folds, especially on the neck, shoulders, haunches, and thighs. The eyes are small, placed nearer the nose than in other quadrupeds, and high towards the upper surface of the skull; the ears are moderate and erect. The head is large and ponderous: it is elevated between the ears, whence it sweeps with a concave line to the nasal bones, which rise in the form of an arch to support the horn (see skeleton, Fig. 6). The upper lip is soft, flexible, sensitive, capable of being protruded, and used to a certain degree as an organ of prehension.

But that which gives most character to the head of the rhinoceros is its horn, single in some species, double in others. This organ is of an elongated, recurvent, conical figure, arising from a broad, limpet-shaped base, seated on the nasal bones, which are of a thickness and solidity not to be found in other races of quadrupeds. They form a vaulted roof, elevated in a remarkable degree above the intermaxillary bones, containing the incisor teeth, and their upper arched surface is rough with numerous irregularities and depressions; and here we may pause, to reflect on the advantages gained by their form and structure. They have not merely to sustain the weight of the horn, no trifle in itself, but to resist the shock occasioned by the violent blows which the animal gives with the weapon upon various occasions. Hence, conjoined with their solidity, that form is given



6.—Skeleton of Rhinoceros.

to the nasal bones which, of all others, is best calculated for sustaining a superincumbent weight or sudden jars; while the rugosities and depressions tend to the firmer adhesion of the skin, to which the horn is immediately attached. In the two-horned species the posterior horn rests on the os frontis. The nasal horn of the rhinoceros is a solid mass, structurally composed of agglutinated fibres analogous to hair, and much resembling those into which whalebone is so easily separable.

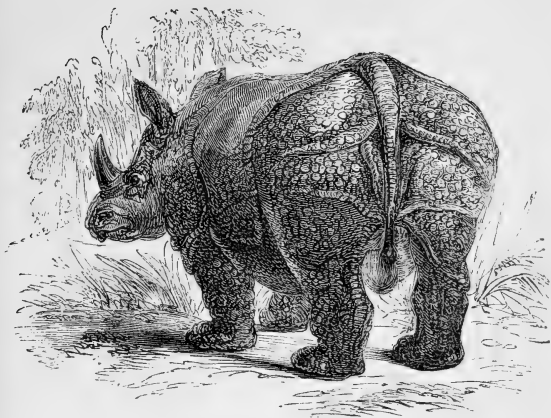
It has been asserted by some travellers that the horns of the African species are moveable, and that the animal rattles them against each other: this, however, is a mistake—they are firmly fixed. The nostrils are on each side of the upper lip; the tongue is perfectly smooth, contrary to what is alleged by many of the older writers, who describe it to be covered with spines, and capable of lacerating the skin. The senses of smell and hearing are very acute. Dentition variable: canines wanting. In the Indian rhinoceros the formula is as fol-

lows:—Incisors, $\frac{4}{4}$; molars, $\frac{7-7}{7-7} = 36$.

THE INDIAN RHINOCEROS

In his native regions leads a tranquil, indolent life: like the elephant, he gives preference to the marshy borders of lakes and rivers, or swampy woods and jungles, delighting to roll and wallow in the oozy soil, and plaster his skin with mud. He is also fond of the bath, and swims with ease and vigour. The splendid animal in the gardens of the Zoological Society may be often seen during the hot weather of summer enjoying the bath in the paddock appropriated for his exercise, or rolling and wallowing in the mud, or basking luxuriously, half in, half out, of the water, like a huge hog, uttering every now and then a low grunt of self-complacent satisfaction. (Fig. 7.)

Sluggish in his habitual movements, the rhinoceros wanders through his native plains with a heavy step, carrying his huge head so low that his nose almost touches the ground, and stopping at intervals to crop some



7.—Indian Rhinoceros.

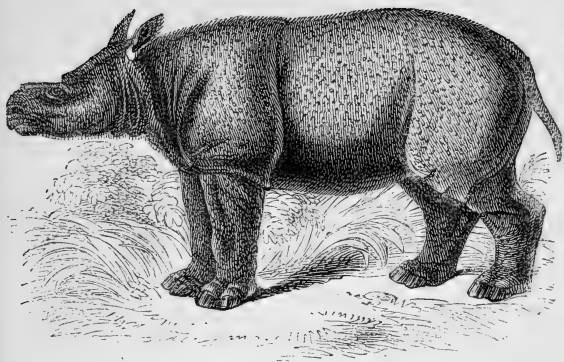
favourite plant, or, in playful wantonness, to plough up the ground with his horn, throwing the mud and stones behind him. The jungle yields before his weight and strength, and his track is said to be often marked by a line of devastation. When roused the rhinoceros is a most formidable antagonist, and such is the keenness of his senses of smell and of hearing, that, unless by very cautiously approaching him against the direction of the wind, it is almost impossible to take him by surprise. On the appearance of danger the rhinoceros generally retreats to his covert in the tangled and almost impenetrable jungle, but not always, and instances are on record in which, snuffing up the air and throwing his head violently about, he has rushed with fury to the attack, without waiting for the assault. There are, in fact, seasons in which the rhinoceros is very dangerous, and attacks every animal with impetuosity that attracts his notice or ventures near his haunts, even the elephant himself.

From the earliest times the horn of the Indian rhinoceros (the observation applies to other species also) has been regarded either as an antidote against poison or as efficacious in detecting its presence, as well as useful in curing disease. The Indian kings made use of it at table, because, as was believed, "it sweats at the approach of any kind of poison whatever." Goblets made of it are in high estimation; these are often set with gold or silver, and sell for large sums: when poison is poured into them, the liquor, it is said, betrays its noxious qualities by effervescing till it runs over the brim: water drunk from them, or from the cup-like hollow at the base of the horn, is regarded as medicinal. In the latter case the water is to be stirred in the hollow with the point of an iron nail till it becomes discoloured, when the patient must drink it.

The strong deep folds into which the coarse skin is gathered in the cheeks, neck, shoulders, haunches, and thighs, are distinguishing characters of the Indian rhinoceros. The general colour of the skin is dusky black, with a slight tint of purple. Mr. Hodgson ('Proceedings of the Zoological Society,' 1834) states that the female goes from 17 to 18 months with young, and produces one at a birth: he adds also, "It is believed that the animal lives for 100 years; one taken mature was kept at Katmandoo for 35 years without exhibiting any symptoms of approaching decline. The young continues to suck for nearly two years: it has for a month after birth a pink suffusion over the dark colour proper to the mature hide." The female is desperate in the protection of her young.

THE JAVANESE RHINOCEROS (*Rh. Javanus*).

As far as is ascertained, this species is confined to the island of Java, where it is called Warak. In the character of the incisor teeth, and the horn being single, it agrees with the Indian species; but it is a less bulky animal, and, in proportion, more elevated in the limbs; the folds of the skin are both less numerous, less deep, and



8.—Javanese Rhinoceros.

also differently arranged: the surface of the skin is divided into small polygonal tubercles with a slight central depression in each, from which arise a few short bristly hairs. (Fig. 8.) In its habits this species is gregarious; its range on the island extends from the level of the ocean to the summits of mountains of considerable elevation—the latter situations are preferred; its retreats in these mountains are to be discovered by deeply excavated passages worked out on their declivities. When met with, or otherwise disturbed, it quietly retires, being very mild and peaceable. Night is the principal season of its activity, and it often commits considerable damage in the plantations of coffee and pepper. The horns and skin are employed for medicinal purposes by the natives. Dr. Horsfield ('Zoological Researches in Java') gives a detailed account of one of these animals which was kept at Suracarta. He says that "by kind treatment it soon became domesticated to such a degree, that it permitted itself to be carried in a large vehicle, resembling a cart, to the capital of Suracarta. I saw it during its conveyance,

and found it perfectly mild and tractable. At Suracarta it was confined in the large area or square which bounds the entrance to the royal residence. A deep ditch about three feet wide limited its range, and for several years it never attempted to pass it. It was perfectly reconciled to its confinement, and never exhibited any symptoms of uneasiness or rage, although on its first arrival harassed in various ways by a large proportion of the inhabitants of a populous capital, whose curiosity induced them to inspect the stranger of the forest. Branches of trees, shrubs, and various twining plants were abundantly provided for its food: of these the species of *Cissus*, and the small twigs of a native fig-tree, were preferred. But plaintains were the most favourite food; and the abundant manner in which it was supplied with these by the numerous visitors tended greatly to make the animal mild and sociable. It allowed itself to be handled and examined freely, and the more daring of the visitors sometimes mounted on its back. It required copious supplies of water, and, when not taking food or intentionally roused by the natives, it generally placed itself in the large excavations which its movements soon caused in the soft earth that covered the allotted space. The animal rapidly increased in size: in the year 1817, having been confined at Suracarta about nine or ten months, the dimensions were nine feet in length, and above four feet three inches in height at the rump. In 1821 it had acquired the height of five feet seven inches.

“This information I received from my friend Mr. Stavers, who is now in England on a visit from the interior of Java; and he favoured me further with the following detail, which completes the history of the individual.

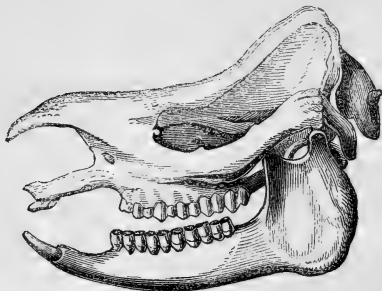
“Having considerably increased in size, the ditch of three feet in breadth was insufficient for confining it; but, leaving the enclosure, it frequently passed to the dwellings of the natives, destroying the plantations of fruit-trees and culinary vegetables which always surround them. It likewise terrified those natives that accidentally

met with it, and who were unacquainted with its appearance and habits. But it showed no ill-natured disposition, and readily allowed itself to be driven back to the enclosure like a buffalo. The excessive excavations which it made by continually wallowing in the mire, and the accumulation of putrefying vegetable matter, in the process of time became offensive at the entrance of the palace, and its removal was ordered by the Emperor to a small village near the confines of the capital, where, in the year 1821, it was accidentally drowned in a rivulet.

“The rhinoceros lives *gregarious* in many parts of Java. It is not limited to a peculiar region or climate, but its range extends from the level of the ocean to the summit of mountains of considerable elevation. I noticed it at Tangung near the confines of the Southern Ocean, in the districts of the native princes, and on the summit of the high peaks of the Priangan Regencies; but it prefers high situations. It is not generally distributed, but is tolerably numerous in circumscribed spots distant from the dwellings of man, and covered with a profuse vegetation. On the whole, it is more abundant in the western than in the eastern districts of the island. Its retreats are discovered by deeply excavated passages which it forms along the declivities of mountains and hills. I found these occasionally of great depth and extent. In its manners the rhinoceros of Java is comparatively mild. It is not unfrequently met in the wilds by Europeans and natives. No instance of its showing a disposition to make an attack has come to my knowledge: being the largest animal in Java, its passions are not roused, as in many parts of India, by contentions with the elephant. It is rarely seen in a domestic state, but is occasionally decoyed into pits and destroyed. Our animal rambles chiefly at night, and often occasions serious injury to the plantations of coffee and pepper which are laid out in the fertile districts selected for its retreats. The horns and skin are employed for medicinal purposes by the natives.”

The Javanese rhinoceros was known to Bontius, who

wrote on the productions of that island in 1629. Fig. 9 represents the skull of this species, which is more elongated in proportion and less heavily made than that of the Indian animal.



9.—Skull of Javanese Rhinoceros.

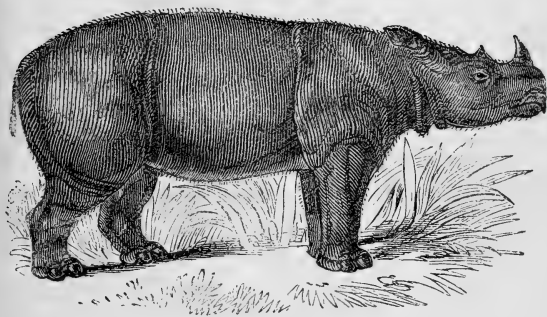
THE SUMATRAN RHINOCEROS

(*Rh. Sumatranus*, Raffles)

Was first described by Mr. Bell, surgeon in the service of the East India Company, at Bencoolen ('Philosophical Transactions,' 1793); but it appears to have been indicated previously by Mr. C. Miller, long resident in Sumatra (Pennant's 'History of Quadrupeds,' 3rd ed., vol. i.). The head is more elongated than in the other two species, and there are two horns on the nose; the neck is thick and short, the limbs massive; the skin is rough and black, and covered with short hair; the folds are very inconsiderable, but are most distinct on the neck, shoulders, and haunches. (Fig. 10.) The female is stated to have a heavier head than the male. The number of incisors is four in each jaw, but of these the lateral ones are very small and soon fall out; hence Bell and others supposed the number to be only two.

The Sumatran rhinoceros is by no means bold or

savage; one of the largest size has been seen to run away from a single wild dog. Its native name is Badak, whence the term Abadia, or Abath, applied to the Indian rhinoceros by our early navigators. Sir S. Raffles says that, besides this species, there is another animal in the forests of Sumatra, never noticed, which in size and character nearly resembles this rhinoceros, but which is said to have a single horn, and to be distinguished by a narrow white belt encircling the body. The natives of the interior term it Tenu, which, at Malacca, is the name



10.—Sumatran Rhinoceros.

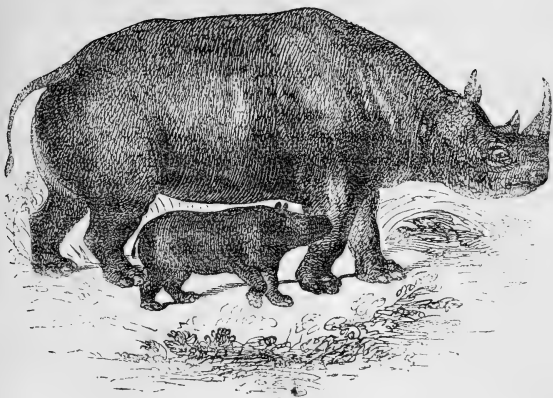
of the Tapir; but in Sumatra the name of the Tapir is Gindol and Babialu. In the interior, however, where different tribes shut out from general communication speak different dialects, it is probable that the term Tenu may be the name applied by some, as at Malacca, to the tapir, and hence would the confusion arise; for, from the description, notwithstanding the assertion that it possesses a horn, we cannot help regarding this Tenu of the forest of the interior as the tapir.

Of the African species of rhinoceros we may first notice the

BLACK OR COMMON AFRICAN RHINOCEROS

(*Rh. bicornis*, Linn.; *Rh. Africanus*, Cuv.).

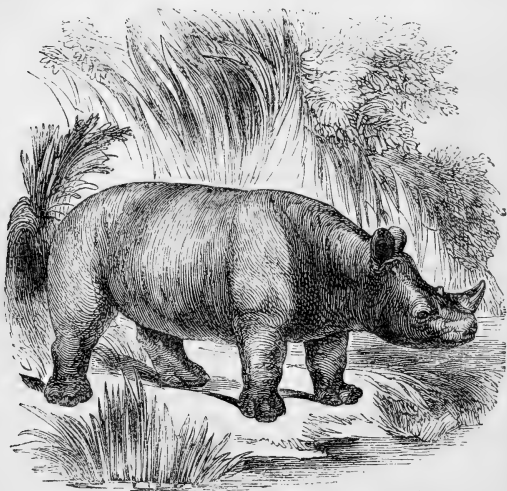
This huge animal, though driven from the precincts of the colony, is still extensively spread throughout the southern regions of Africa. When the Dutch first formed their settlement on the shores of Table Bay, this rhinoceros was a regular inhabitant of the thickets which clothed the lower slopes of the mountain: but it has retired, and continues to retire, before the advance of colonization and the gun of the hunter. This species differs from the Indian, not only in the possession of a double horn, but in the absence of massive folds of skin, and in wanting the incisor teeth. The skin is thick, coarse, scabrous, and forms a deep furrow round the short thick neck; the head is heavy; the eyes are small, and the skin round them, and on the muzzle, and before the ears, is wrinkled; the upper lip is slightly produced, and prehensile. The anterior horn is long, fibrous at the base, hard, and finely polished at the point; the posterior horn is short and conical. General colour yellowish brown, with tints of purple upon the sides of the head and muzzle; eyes dark brown. Length about eleven feet. A few black hairs fringe the edge of the ears and the tip of the tail. (Fig. 11.) This animal feeds upon brushwood, and the smaller branches of dwarf trees, "from which circumstance," says Dr. Smith, "it is invariably found frequenting wooded districts, and in those situations its course may be often traced by the mutilations of the bushes. The mass of vegetable matter consumed does not appear to be in proportion to the bulk of the animal: indeed, as it feeds but slowly, and passes much of its time in idleness, it must be regarded as a very moderate eater, and, considering that it appears to be fastidious in the choice of its food, it is fortunate for its comfort that it does not require more nourishment." Of the senses of the rhinoceros, those of hearing and smell are very acute, and aid the animal more than his sight in the discovery of danger, the bulk of the body screening ob-



11.—Black Rhinoceros and Young.

jects not immediately before the eyes. “As these animals depend much upon smell for their existence and safety, it is necessary to advance upon them from the leeward side, if the aim be to get close without being discovered. In pursuit they also trust for guidance to the same sense, and may be heard forcibly inspiring the air, when they have lost the scent of the object they are following. The ticks and other insects with which they are covered furnish for them another source of intelligence, inasmuch as they attract a number of birds, which sit quietly picking them off when nothing strange is in sight, but fly away when any object excites their fear. So well does the rhinoceros understand this, that he proceeds feeding with the greatest confidence while the birds continue perched upon his back; but the moment they fly, the huge animal raises his head and turns it in all directions to catch the scent. Whether he accom-

plishes this or not, he generally feels so uncertain of his position, that he moves to some other locality." The same observations apply to the other African species. (Fig. 12.) When disturbed or attacked the rhinoceros becomes furious, and especially when wounded: he then rushes towards his foe, and, if he can get the hunter once within his sight, the escape of the latter, unless he exert great presence of mind, or the well-directed shot of a companion stop the animal in his career, is very doubtful. The best plan is to wait till the enraged beast approaches, and then step aside suddenly, where some bush or inequality of the ground may afford a shelter, and give time to the hunter for reloading his gun before the rhinoceros gets sight of him again, which fortunately it does slowly and with difficulty. Travellers in the regions



12.—African Rhinoceros.

frequented by this animal are not safe during the night from its attacks. It appears to be excited by the glow of a fire, towards which it rushes with fury, overturning every obstacle. It has, indeed, been known to rush with such rapidity upon a military party lodged among the bush covering the banks of the Great Fish River, that before the men could be aroused it had severely injured two of them, tossed about and broken several guns, and completely scattered the burning wood. Le Vaillant, in his animated account of a rhinoceros-hunt, describes the enraged and wounded animals as ploughing up the ground with their horns, and throwing a shower of pebbles and stones around them; and Dr. Smith says that they are sometimes seen to plough up the earth for several paces with the front horn when not enraged, but for what object he could not discover. The native (Bechuana) name of this species is Borili. The following is Le Vaillant's narrative:—"In the midst of this immense menagerie, the variety of which kept me in a continual state of enchantment, I was surprised not to find that prodigious number of rhinoceroses which had been mentioned to me by the people of Haripa's horde.

"One day, however, Klaas, who was always concerned in every matter of importance, and the first to communicate agreeable intelligence, came in great haste to my tent to inform me that he had observed at some distance from my camp two of these animals standing quietly close to each other in the middle of the plain, and that I had it in my power to enjoy the pleasure of the finest hunt I had ever yet experienced.

"The hunt indeed promised to be amusing, but, independently of danger, I foresaw that it was likely to be attended with difficulties. To attack two such formidable enemies it was necessary to use great precaution, and that we should approach them in such a manner as that they might neither see nor smell us, which is always very difficult. I at first proposed to form a ring which should surround them on all sides, and to advance upon them, gradually contracting the circle, so as to unite the moment

we were about to commence our attack ; but the savages assured me that with these animals this plan was impracticable. I gave myself up therefore entirely to their direction, and we set out armed alike with a good fusce and with the necessary courage. All my hunters wished to be of the party, and each proposed to display the greatest prowess. I caused two of my strongest dogs to be led in a leash, in order that they might be let loose on the rhinoceroses in case it should be found necessary. We were obliged to make a long circuit to gain the lee side of them, lest they should smell us ; and we reached the river, the course of which we followed under cover of the large trees that grew on its banks, when Klaas soon made us observe the two animals at about the distance of a quarter of a league in the plain. As one of them was much larger than the other, I supposed them to be a male and female. Motionless by the side of each other, they were still in the same posture in which Klaas had first seen them, but they stood with their noses to the wind, and consequently presented to us their rumps.

“ It is the custom of these animals when thus at rest to place themselves in the direction of the wind, in order that they may discover by their smell what enemies they have to dread. From time to time, however, they move their heads round to take a look behind them, and to be assured that they are safe on all sides, but it is only a look, and they soon return to their former position.

“ We were already deliberating on the dispositions to be made for commencing the attack, and I was giving some orders to my company, when Jonker, one of my Hottentots, requested that I would permit him to attack the two animals alone as a *vekruyper*.

“ My readers will here recollect that, when I foolishly attempted to cross the Elephant's river, near its mouth, on the trunk of a tree, Jonker was one of the swimmers who saved my life, and that in return, at the desire of his companions, I raised him to the rank of hunter. At that time he was entirely a novice in this exercise, but I have already remarked that he afterwards became a most excellent shot, and surpassed all the rest

of my hunters, particularly in the art of creeping. I have before observed that hunting in Africa has no resemblance to that in Europe ; that to get within the reach of certain wild animals we must approach them without being perceived ; and that it is impossible to get near them but by creeping on the belly. Those who have acquired this art are called *vekruypers*, and it was in this quality that Jonker asked leave to attack alone the two rhinoceroses, assuring me that he would acquit himself to my satisfaction.

“ As his design would not prevent the execution of our plan, and as, in case his particular attack should not succeed, it would not impede our general one, I granted his request. He then stripped himself naked, and, taking his fusee, proceeded towards the animals, creeping on his belly like a serpent.

“ In the mean time I pointed out to my hunters the different posts they were to occupy. They repaired to them by circuitous ways, each accompanied by two men. As for me, I remained on the spot where I was with two Hottentots, one of whom held my horse and the other my dogs ; but, to avoid being seen, we posted ourselves behind a bush.

“ In my hand I held a glass, which had often enabled me to see the operation of stage machinery and the effect of our theatrical decorations. How changed the scene ! At this moment it brought before me two hideous monsters, which at times turned towards me their frightful heads. Their movements, which indicated fear and observation, soon became more frequent, and I was apprehensive they had heard the agitation of my dogs, who, having discovered them, made efforts to escape from the keeper, and rush upon them. Jonker still kept slowly advancing, but with his eyes fixed on the two animals. If he saw them turn their heads, he stopped, and remained motionless ; one would have taken him for a large stone, and indeed in this respect I myself was deceived. He continued creeping with various interruptions for more than an hour. At length I saw him proceed towards a large bush of *cuphorbia*, which was only 200 paces from the

animals. Being certain when he reached it that he could conceal himself there without being seen, he rose up, and, casting his eyes everywhere around, to see whether his comrades had arrived at their posts, he made preparations for firing. During the time he was creeping along I had followed him with my eye, and in proportion as he advanced I felt my heart beat with involuntary palpitation.

“This palpitation, however, increased when I saw him so near the animals, and just upon the point of firing at one of them: what would I not have given at that moment to have been in the place of Jonker, or at least by his side, that I might have brought down also one of these savage monsters! I waited with the utmost impatience the report of the gun, and I could not conceive what prevented him from firing, but the Hottentot who stood near me, and who was able by the bare sight to distinguish him as perfectly as I could with my glass, informed me of his design. He told me that Jonker did not fire because he was waiting till one of the rhinoceroses should turn round, that he might if possible take aim at his head, and that on the first motion they made I should hear the report.

“Presently, the largest of the two, having looked behind, was immediately fired at; being wounded, he sent forth a horrid cry, and, followed by the female, ran furiously towards the place whence the noise had proceeded. I found my heart now agitated by the most violent emotion, and my fear was carried to its utmost extent. A cold sweat diffused itself over my whole body, and my heart beat with such force as to prevent me from breathing. I expected to see the two monsters tear up the bush, tread the unfortunate Jonker under their feet, and tear him to pieces; but he had thrown himself down with his belly on the ground, and this stratagem succeeded. They passed close by his side without perceiving him, and came straight towards me. My fear now gave place to joy, and I prepared to receive them; but my dogs, animated by the report they had heard, became so restless on their approach, that, being

unable to check them, I ordered them to be let loose, and encouraged them to the attack. When the animals saw this, they instantly turned aside, and proceeded towards another of the hunters placed in ambush, from whom they received a second fire, and then to another, from whom they received a third; my dogs, on the other hand, harassed them prodigiously, which still increased their rage; they kicked at them in the most terrible manner, ploughed up the plain with their horns, and, digging furrows in it seven or eight inches in depth, threw around them a shower of pebbles and stones.

“During this time we all kept approaching in order to surround them more closely, and to unite against them our forces. The multitude of enemies by which they found themselves enclosed rendered them completely furious. The male, however, suddenly stopped, and, turning round to attack the dogs, endeavoured to rip up their bellies with his horn, and while he was engaged in pursuing them the female quitted him and made her escape. I was highly pleased at her flight, which I considered a fortunate circumstance; for it is certain, notwithstanding our number and our arms, we should have been much embarrassed by two so formidable adversaries. I must even confess that without the assistance of my dogs we should not have been able to combat, but with great hazard and danger, the one that remained. The bloody traces which he left wherever he went announced that he had received more than one wound; but, reduced to despair, he only defended himself with the greater obstinacy.

“After a fruitless attack, which lasted for some time, he began to retreat, and seemed as if desirous of gaining some bushes, apparently with a view of finding shelter, and to prevent his being harassed but in front. I guessed this stratagem, and, in order to disappoint him, I rushed towards the bushes, and made a sign to the two hunters who were nearest to me to advance there also. He was only thirty paces from us when we took possession of the post; accordingly, we all at the same time presented our pieces, and, discharging our three shots,

he instantly fell, and was never after able to rise. I beheld his fall with the utmost satisfaction : as a hunter and a naturalist it afforded me a double triumph.

“ Though mortally wounded, the animal still continued to defend himself when lying on the ground as he had done when on his legs ; with his feet he threw around him heaps of stones, and neither we nor our dogs durst venture to approach him.

“ I wished to put an end to his torment by firing one more ball, and was making preparations for the purpose, when my people entreated me to desist. As I could not ascribe their request to pity, I was at a loss to conceive what could be their motive. I have already said that all the savage tribes, and even the people at the Cape and in the colonies, set a high value on the dried blood of the rhinoceros, to which they ascribe great virtues. . . . The animal had lost a great deal by his wounds. It was with much regret that they saw the earth moistened with it around him, and they were apprehensive that a new wound would increase that loss.

“ Scarcely had the animal breathed his last, when both old and new Hottentots all approached with eagerness in order to collect the blood. With that view they cut open its belly, and took out the bladder, which they emptied. One of them then applied the mouth of it to one of the wounds, while the rest shook a leg of the animal to make the blood flow more readily. In a little time, to their great joy, the bladder was filled, and I am persuaded that with what was lost they might have filled twenty.

“ I had approached the body also, but with a different design ; for my intention was only to measure and examine it.

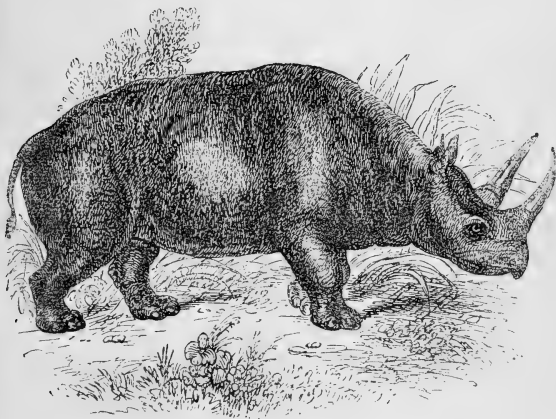
“ The savages of the horde, accustomed to see such animals very often, assured me that it was one of the largest of its species.

“ I however did not believe them, and what induced me to doubt their information was, that its principal horn was only (in French measure) nineteen inches three lines in length, and I had seen horns much longer,

in the possession of some of the Dutch planters. The height of the animal was seven feet five inches ; and its length, from the snout to the root of the tail, eleven feet six inches."

THE KEITLOA (*Rh. Keitloa*, Smith).

In general figure this savage species resembles most nearly the common African rhinoceros. (Fig. 13.) There are, however, Dr. Smith observes, many marked



13. -Rhinoceros Keitloa.

differences between them, of which the following are a few of the external and more palpable. In *Rhinoceros Keitloa* the two horns are of equal or nearly equal length ; in *Rhinoceros Africanus* the posterior in neither sex is ever much beyond a third of the length of the anterior horn ; the length of the head in proportion to the depth is very different in the two. The neck of *Rhinoceros Keitloa* is much longer than that of the other, and

the position and character of the cuticular furrows destined to facilitate the lateral motions of the head are very different. Besides these, Dr. Smith states that many other diagnostic characters might be instanced; such as the black mark on the inside of the thigh of the keitloa, the distinctly produced tip of the upper lip, and the comparatively few wrinkles on the snout and parts around the eyes.

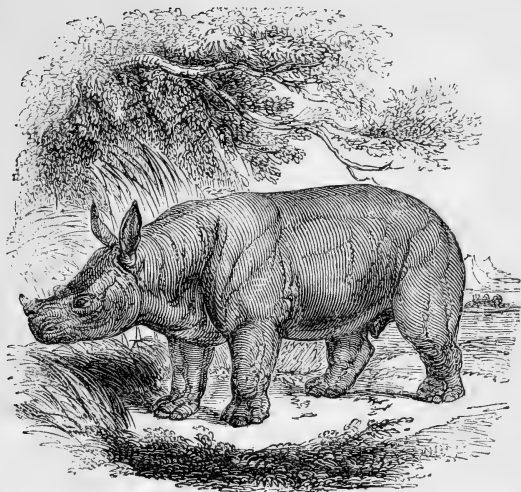
The first example of this animal which Dr. Smith met with during his expedition was shot about 180 miles N.E. of Lattokoo, but considerably south of the country to which the species appears directly to belong, and from which it might be considered as a wanderer. On the expedition penetrating to the northward of Kurrichane, every one was found conversant with the name, and able to direct to situations where the animal was found. Few mentioned the keitloa without alluding to its vindictive temper and ferocity; and those, says Dr. Smith, who had sufficient confidence in the party, compared to it a chief then awfully oppressing that part of the country, and spoke of the man and the animal as alike to be feared. As the party advanced, the keitloa became more common, though it never occurred in such numbers as the other two species.

"The interest," says Dr. Smith, "which the discovery of this species excited, led to the making of minute inquiries as to the animals of this genus; and the expedition had sufficient reason to believe, from the replies to constant questions, that two other undescribed species existed farther in the interior, one of which was described as being something like the keitloa, and having two horns—the other as differing in many respects, and having only *one* horn. The keitloa browses on shrubs and the slender branches of brushwood, using the upper lip as an organ of prehension."

THE WHITE OR BLUNT-NOSED RHINOCEROS

(*Rh. simus*),

Termed Mohoohoo by the Bechuanas, is larger than the two former species, being upwards of twelve feet in

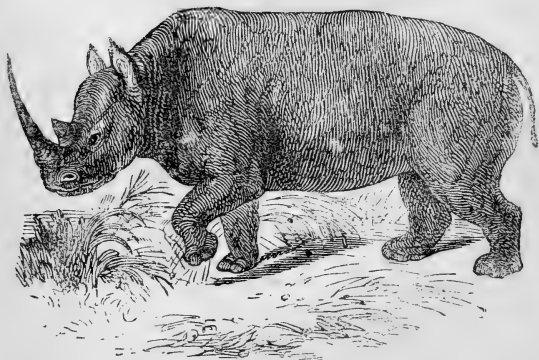


14.—White Rhinoceros.

length, and nearly six feet in height. It is a huge, massive animal, with the neck longer than in the other African species, having three deep wrinkles running from the nape down the sides ; the muzzle is truncate, the mouth shaped like that of an ox, the upper lip perfectly square, and destitute of the mobility and power of protrusion which it exhibits in the other species. (Fig. 14.) Hence, instead of browsing upon shrubs, it feeds principally upon grass, and therefore frequents open plains where such herbage abounds, wandering very extensively in search of pasturage. This animal was first described by Mr. Burchell, who when at Lattakoo found it in abundance there, and Mr. Campbell brought the head of one to England. In the mohooohoo the horns are situated close to the extremity of the nose : the first

is very long, tapered to a point, and slightly curved back; the second is short, conical, and obtuse. The general colour is pale broccoli-brown; the buttocks, shoulders, and under parts shaded with brownish purple; tail clothed with stiff black hair. (Fig. 15.) According to Dr. Smith, the introduction of fire-arms among the Bechuanas has rendered this animal rare in the district where Mr. Burchell found it numerous: higher up the country, however, it still maintains its ground. In disposition it differs from the other two species, being much more gentle, and is therefore regarded with less fear than either the keitloa or the borili.

The flesh of all three species is esteemed wholesome food by the natives, who dig pitfalls for them in situations to which they are known to resort; and sometimes, though rarely with success, attempt to kill them with the assagai or spear. In style of motion they are all alike, and so awkward that their swiftness is to be appreciated not by directly watching the animal itself, but by fixing the eye upon some two points between which it



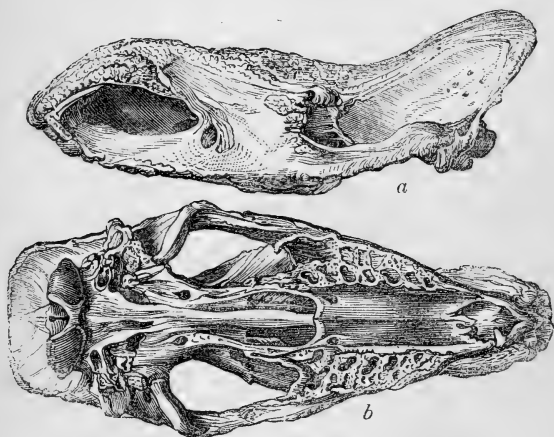
15.—Two-horned Rhinoceros.

takes its course. To revert to the one-horned rhinoceros, of which Dr. Smith heard in the interior of South Africa, and of which Bruce and Burckhardt received accounts as existing in Adel and the country south of Sennaar, it may be added that Dr. Smith adduces the testimony of Mr. Freeman respecting an animal by no means rare in Makooa, north of the Mozambique Channel, which, overlooking the absurdities and exaggeration of the description, he suspects to be a one-horned rhinoceros, and probably that of which he heard, and which may extend to the countries mentioned by Bruce and Burckhardt.

Among the fossil relics of animals which at some former period have tenanted this globe, and after a quiet possession, generation succeeding generation, of their pasture-lands, have become as it were blotted out of the book of creation, those of the rhinoceros are extremely abundant, little less so, if at all, than those of the fossil elephant or mammoth, as widely distributed, and occurring in the same strata and the same localities. Several species have been distinctly made out, among which the most remarkable is that with a bony partition between the nostrils, and supporting the nasal bones: it is termed by Cuvier *Rh. tichorhinus*. Fig. 16 represents the skull in two views: *a*, profile; *b*, seen from below.

It was of this species that Pallas in 1771 discovered an entire frozen carcase buried in the sand on the banks of the Wilouji or Viloui, which joins the Lena, in Siberia. Happily, therefore, we know the form and true proportions of the living animal. The skin was smooth and destitute of folds, and, like the common African rhinoceros, the animal had two horns. The feet had three toes, as in all extant species, but the hoofs were lost. Like the mammoth of Siberia, this animal was originally covered with hair: in many parts of the skin this hair still remained, especially over the feet, where it was very abundant, measuring from one to three inches in length, of a stiff quality, and of a dusky gray. The head was invested with a similar clothing. The head and feet are preserved in their natural state in the museum of St. Petersburg.

The skull of this species differs from that of the two-horned African rhinoceros, not only in the presence of the osseous nasal partition, but in general form and proportions. The length and narrowness of the skull are very remarkable, as is also the space between the orbits, which is much more contracted than in the common two-horned species, and the nasal bones are far more elongated. In the two-horned rhinoceros the disc which bears the anterior horn is a semi-sphere, in this an oblong ellipse, and a disc of similar figure supports the second horn, whence it may be safely concluded that the horns



16.—Skull of Fossil Rhinoceros.

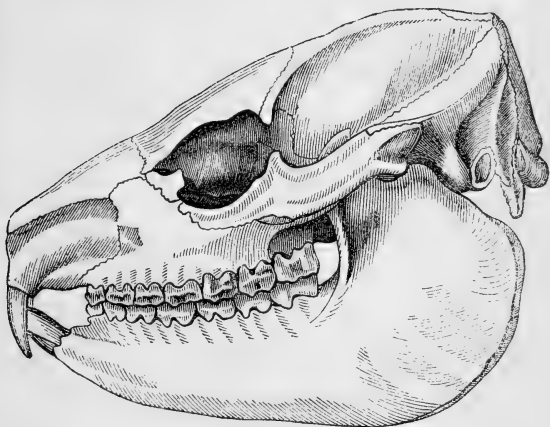
of this fossil species were strongly compressed at the sides. The occipital ridge is elevated and drawn out backwards, so that from the highest point the occipital bone slopes at a very acute angle inwards to the condyles.

About nine fossil species of rhinoceros are described.

Almost every bone-cavern in England, France, and Germany has afforded them in abundance; and Dr. Buckland proves that there must have been a long succession of years in which the elephant, hippopotamus, and rhinoceros, with the hyæna, inhabited our island; and that the former, as the bones testify, became the prey of the latter, or were devoured after natural or accidental death.

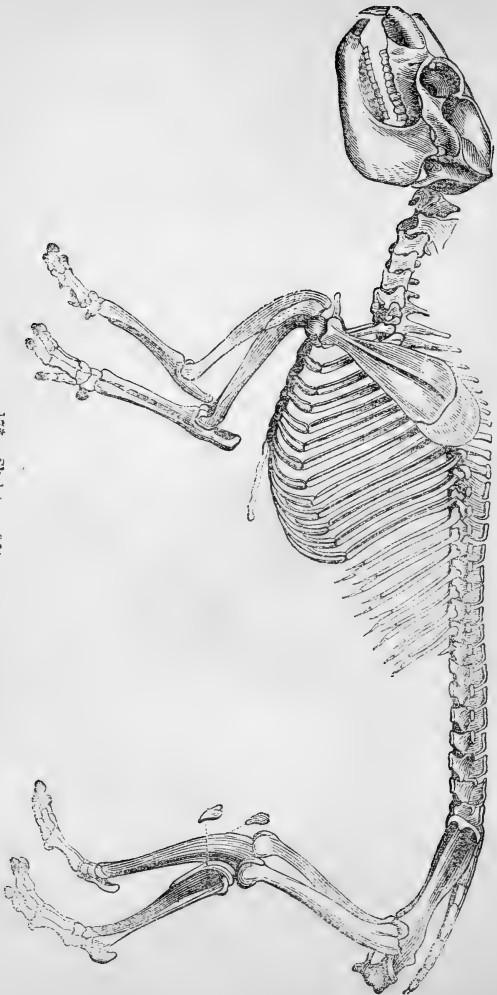
THE DAMAN, OR HYRAX.

When we look at the rabbit-like hyrax, it does not surprise us to find that all the older naturalists regarded it as a Rodent, and placed it in that order. It was reserved



17.—Skull of Daman.

for Cuvier to point out its true situation. “There is no quadruped,” says this great man, “which proves more forcibly than the daman the necessity of having recourse to anatomy, as a test by which to determine the true relationship of animals.” This fur-covered active creature



17*.-Skeleton of Yaman.

is a true pachydermatous animal, and, notwithstanding the smallness of its size, it is to be regarded as "intermediate between the rhinoceros and tapir." The resemblance which the hyrax bears to the former may be traced in its osseous system and internal anatomy (see 'Proceeds. Zool. Soc.' 1832 and 1835). On these points it would here be out of place to dwell; we have, however, figured the skull (Fig. 17), which to many will be of interest. With respect to the skull, the sin-



18.—Hyrax.

gular depth of the lower jaw cannot but strike every attentive observer; and it may be added that in the convexity of the posterior edge of the ascending portion it surpasses that even of the tapir, which, in this respect, is the nearest among all animals to the hyrax.

In other particulars the skull approaches that of the rhinoceros; the molar teeth, in fact, are those of the rhinoceros in miniature, both as to form and number. There are, as in the rhinoceros, no canines. The upper incisors, two in number, are long, triangular, pointed, stout, and separated from each other by a small interval. The lower incisors are four in number, set in close array, flat, and directed forwards. At first their edges are notched, but they become smooth by use. The molars are seven on each side, above and below: but the first, which is small, falls out, being worn down as soon as the last molar on each side has arisen; and, in old individuals, the next is frequently wanting also.

With respect to the skeleton (Fig. 17*), it may be remarked that there are 21 ribs on each side, a number greater than in any other quadruped, except the two-toed sloth, which has 23. The elephant and tapir follow the hyrax. The fore feet are divided into four toes, tipped with hoof-like nails; the hind feet into three, of which the innermost is furnished with a long claw-like nail. The toes are all buried in the skin, as far as the little hoofs, precisely as in the rhinoceros.

Several species belong to the present genus: we have figured the Cape hyrax or daman. (Fig. 18.)

THE CAPE HYRAX, OR DASSIE OF THE COLONISTS

(*Hyrax Capensis*),

Is common in the rocky and mountain districts of South Africa, taking up its abode in the fissures of the rugged crags, which afford it an asylum. It abounds on the sides of Table Mountain, but is so wary, quick, and active, that it is not to be approached without much difficulty. It often, however, falls a prey to the eagle and falcon, which pounce upon it while feeding in apparent security. The vulturine eagle (*Aquila vulturina*), which makes the mountain precipices its abode, destroys it in great numbers. This timid little animal is gregarious in its habits, like the rabbit, which it somewhat exceeds in size. The fur is soft and deep, and of a dark

grayish brown, becoming of a paler tint beneath. There is no tail. The following communication, by Mr. W. R. Read (see 'Proceedings of the Zoological Society,' 1835, p. 13), needs no apology for its insertion:—

“The *Hyrax Capensis* is found inhabiting the hollows and crevices of rocks, both on the summits and sides of hills, as well as near the sea-shore, even a little above high-water mark. It appears to live in families, and is remarkably shy in its wild state. In winter it is fond of coming out of its hole, and sunning itself on the lee side of a rock, and in summer of enjoying the breeze on the top; but in both instances, as well as when it feeds, a sentinel is on the look-out (generally an old male), which gives notice, usually by a shrill prolonged cry, of the approach of danger, or even the least movement of any suspicious object. It lives on the young shoots of shrubs, the tops of flowers, herbs, and grass, particularly of all those which are aromatic.”

THE SYRIAN HYRAX (*H. Syriacus*).

This species, according to Bruce, is found in Abyssinia, where it haunts the deep caverns and clefts in the rocks. By the natives of Amhara it is termed Ashkoko, or Askoko. It also tenants the mountains of Syria and Arabia; and, as in days of old, the rocks of Horeb and of Sinai are still “a refuge for the conies.” By the Arabs, according to Dr. Shaw, it is called Daman Israël, that is, Lamb of Israel, or rather Ganam or Gannim Israel, as Bruce contends, the word Daman being mistaken for the latter. Most authorities agree that it is the Shaphan (translated cony) of the Scriptures. The Syrian hyrax agrees in habits with its Cape relative. It tenants the acclivities of the rocks, sheltering itself under projecting ledges, in deep fissures and caves; it is gregarious, and dozens may be often seen either sitting upon the great stones at the mouth of the caves, to warm themselves in the sun, or playfully skipping about in the enjoyment of the freshness of the evening. When captured, they inflict severe wounds with their

formidable incisors, but are soon rendered tame and familiar. Cuvier and many naturalists have hesitated as to the distinctness of the Syrian and the Cape hyrax. They are, as we think, undoubtedly different, and the Syrian species may be distinguished by the presence of long bristle-like, but slender, black hairs, dispersed not very thinly over its body, and considerably exceeding the fur: such at least was the case with the specimen which we examined; while in the numerous specimens from the Cape, of all ages, in the museum of the Zoological Society, nothing of the kind is to be perceived. Bruce, indeed, noticed this peculiarity, and he considered the Amharic name *Ashkoko* "as derived from the singularity of those long herinaceous hairs which, like small thorns, grow about his back, and which in Amhara are called *Ashok*."

A fossil form closely allied to the hyrax, the skull of which has been discovered in the clay near Herne Bay, has been described by Professor Owen.

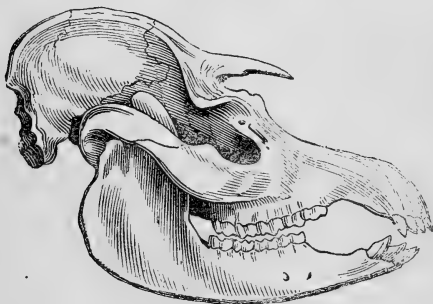
GENUS TAPIRUS.

This genus comprehends, as far as known, only three species, of which two are natives of South America, the other of Sumatra and Malacca.

The geographical distribution of the existing species of pachydermatous animals is so partial, that we are surprised to find the islands of Sumatra and the peninsula of Malacca dividing with South America this limited genus between them. America, compared with Asia and Africa, is deficient in living forms of the Pachydermata; two only are indigenous to that vast continent, viz. the peccary and tapir; and, reasoning from analogy, we should not expect to find either of these forms in any portion of the Old World, and more especially in the islands of the Indian Archipelago. The great mass of the Pachydermata are peculiar to the warmer regions of Asia and the continent of Africa: and many genera, as *Elephas*, *Rhinoceros*, *Sus*, and *Equus*, give species to each, but not to America: so that the existence of cog-

nate species in one of the Indian islands and in South America appears as if it were an exception to a general rule, at least if we limit our views to the races now extant on the earth. Once, indeed, America was replete with animals of this order: and why so few should now appear as their representatives is a point not easy of solution. In their general form and contour the tapirs remind us of the hog; but the snout consists of a flexible proboscis, not, indeed, elongated like that of the elephant, but still sufficiently developed to serve as a hook by which the animal is capable of drawing down twigs to the mouth, of grasping fruit or bunches of herbage. The nostrils open at its extremity in the form of two transverse fissures, but there is no finger-like appendage. (For anatomy see 'Proceeds. Zool. Soc.' 1830, p. 163.)

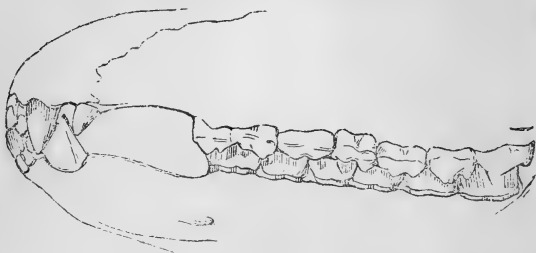
The tapir is a massive, powerful animal; the limbs are thick and moderately long; the head is large, compressed, and, in the American species, elevated at the



19.—Skull of American Tapir.

occiput (see Fig. 19), whence the thick neck rises with a prominent upper crest or ridge, along which runs a mane of stiff thinly-set hairs. The eyes are small and deep set; the ears are rather short; the tail is rudimentary.

The anterior feet are divided into four toes, the hinder into three, the tips only being cased in hoofs. The skin, which is thick, tough, and solid, is sparsely covered, excepting in one species, with very short close hair. The dentition (see Fig. 20) consists of six incisors in each jaw; the canines are small, especially those of the upper jaw, and are separated from the molars by a considerable



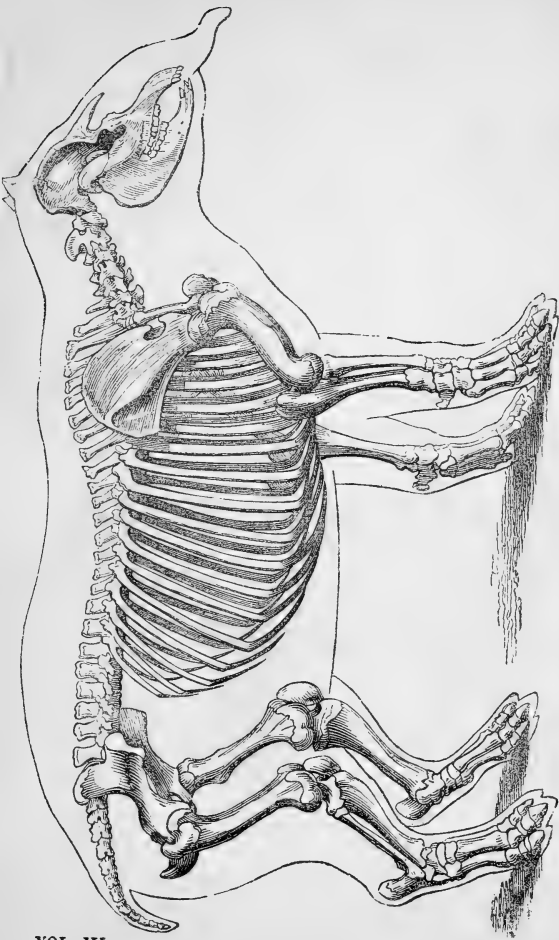
20.—Teeth of Sumatran Tapir.

interval; the molars are seven on each side above, and six below, and, until worn down by attrition, the crowns present two transverse ridges. Fig. 21 represents the skeleton of the ordinary American tapir; in general details it approaches that of the rhinoceros. Of the two species of tapir peculiar to America, one has been only recently discovered. It was found by Dr. Roulin in the most elevated regions of the Cordillera of the Andes, and is covered with long, thick, black hair. The bones of the nose are more elongated than in the other species, and Cuvier regards it as approaching in some respects to the fossil genus *Palæotherium*.

THE COMMON AMERICAN TAPIR

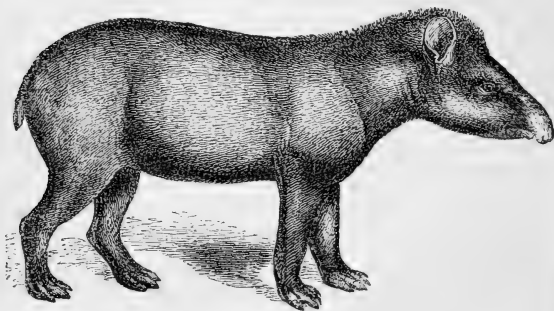
(*Tapirus Americanus*).

This species is very extensively spread throughout the warmer regions of South America, but especially between the tropics, where it inhabits the deep forests, leading a solitary life, and seldom stirring from its retreat during



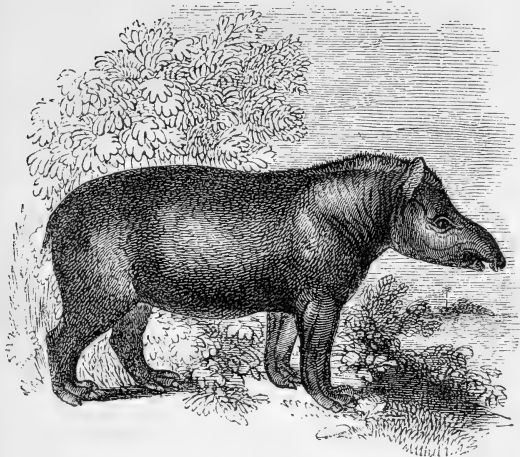
21.—Skeleton of American Tapir.

the day, which it passes in a state of tranquil slumber. During the night, its season of activity, it wanders forth in quest of food, which consists of water-melons, gourds, young shoots of brushwood, &c. Its choice of food is not very limited; and, indeed, it appears to be as omnivorous as the hog. Azara, who states that the Guaranis term this animal Mborebi, and the Portuguese of Brazil, Anta, affirms that it devours the barrero, or nitrous earth of Paraguay, and that he has found a quantity of this substance in the stomach. Its senses of smell and hearing are extremely acute, and serve to give notice of the approach of enemies. Its voice, which it seldom utters, is a shrill kind of whistle, in strange contrast with the massive bulk of the animal. Of enormous muscular power, and defended with a tough thick hide, the tapir is capable of tearing its way through the underwood in whatsoever direction it pleases: when thus driving onwards, it carries its head low, and, as it were, ploughs its course. (Figs. 22 and 22.*)



22.—American Tapir.

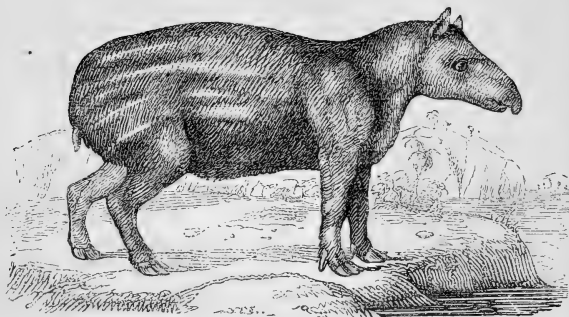
Its fondness for the water is almost as strong as that evinced by the hippopotamus. It swims and dives admirably, and will remain, as we have seen while observing the specimens in the gardens of the Zool. Soc., sub-



22*.—American Tapir.

merged for many minutes, rise to the surface for breath, and plunge again. When hunted or wounded, it always, if possible, makes for the water, and in its nightly wanderings will traverse rivers and lakes in search of food, or for pleasure. The female is very attentive to her young one, leading it about on the land, and accustoming it at an early period to enter the water, where it plunges and plays before its parent, who seems to act as its instructress. The male takes no share in this work, and does not constantly associate with the female.

In its disposition the tapir is peaceful and quiet, and, unless hard pressed, never attempts to attack either man or beast; when, however, the hunter's dogs surround it, it defends itself very vigorously with its teeth, inflicting terrible wounds. We have witnessed those in confinement in the gardens of the Zool. Soc. occasionally break



23.—Young Tapir.

out into fits of irritation, plunging about, lunging violently with their heads, and snapping with their teeth like a hog. The most formidable enemy of this animal (if we except man) is the jaguar; and it is asserted that when that tiger of the American forest throws itself upon the tapir, the latter rushes through the most dense and tangled underwood, bruising its enemy, and endeavouring thus to dislodge him, and sometimes succeeds in the attempt.

In Cavenne the tapir is occasionally domesticated, and is harmless and quiet; it becomes indeed familiar, and often proves troublesome to those who caress it, as may be imagined would be the case with a pet hog under similar circumstances. The adult tapir measures from five to six feet in length, and between three and four in height; its colour is uniform deep blackish brown; the young are longitudinally marked with spots and six or eight bands of fawn-colour along the body, and with numerous spots of the same tint on the cheeks. (Fig. 23.)

THE MALAY OR INDIAN TAPIR

(*Tapirus Indicus*, Farquhar).

This species was first introduced to science by Major Farquhar in 1816. It is a native of Sumatra and the

Malay Peninsula, where it is called *tannoh* or *tennu*; and is as well known in Malacca as the elephant or rhinoceros. In disposition it resembles its American relative. It feeds on vegetables, and is very partial to the sugar-cane. Though the natives have not domesticated it, this species is as easily tamed as the tapir of America, and becomes as gentle and familiar. Major Farquhar possessed one which was completely domesticated, and as much at home as any of the dogs: it fed indiscriminately on all kinds of vegetables, and was very fond of attending at table to receive bread, cakes, and the like. This tapir was procured in the Malay Peninsula. (See 'Trans. Asiat. Soc.,' vol. xv., 1820.) A Sumatran tapir was about the same time presented alive to the Asiatic Society by G. J. Siddons, Esq., resident at Bencoolen. It was of a lazy habit, very familiar, and delighted in being rubbed or scratched; and this favour it solicited from the people about him, by throwing itself down on its side, and making sundry movements. It is distinctly stated of this Sumatran specimen, that another of its great delights was to bathe,—also "that it remained a very considerable time under water." The living specimen, says Sir S. Raffles, sent from Bencoolen to Bengal, "was allowed to roam occasionally in the park at Barrackpore. The man who had the charge of it informed me that it frequently entered the pond, and appeared to walk along the bottom under the water, and not make any attempt to swim." This characteristic habit of the animal was not observed by Major Farquhar in his Malacca specimen. That gentleman says, indeed, that he thought he might venture to affirm that the Malacca tapir is not, like the American species, amphibious in its nature. He adds, that the one he reared showed rather an antipathy to water, and that in the peninsula of Malacca these animals are found to frequent high grounds. As, however, it is admitted on all sides that the Malacca and the Sumatran tapirs are the same, and as these creatures differ in no material points of conformation from the American tapir, it is not easy to imagine that, while the American animal and that from Sumatra are so aquatic in their

habits, the animal from Malacca should exhibit contrary propensities. In Sumatra the tapir inhabits the dense forests of the interior, and is, therefore, seldom seen: hence it has been considered rare in that island: it must, however, be observed, that after the loss of the ship *Fame* by fire, when a living Sumatran tapir with other animals perished, Sir S. Raffles, during the short period of his stay in Sumatra, was enabled to procure other specimens, one of which is in the museum of the Zoological Society, and another in the museum of the East India Company.

The Indian tapir exceeds the American in size: it has no mane, and the snout is longer and more proboscis-like. The most striking external difference between the eastern and western animal, however, is in colour. Instead of being of the uniform dusky-bay tint of the American, the Indian tapir is strangely particoloured. The head, neck, fore limbs, and fore quarters are quite black: the body then becomes suddenly white or grayish-white, and so continues to about half way over the hind quarters, when the black again commences abruptly, and is spread over the legs. The abruptness and contrast of the marking of this animal make it look precisely as if it were covered round the body with a white horse-cloth, leaving the fore and hind quarters exposed. The young, until the age of four months, are black, beautifully marked with spots and stripes of fawn colour above, and white below.

According to Sir S. Raffles, the Indian tapir receives various names in different districts. By the people of Limun it is called Saladang; in the interior of Manna, Gindol; at Bencoolen, Babi Ala; and at Malacca, Tenuu. Marsden states that it is denominated by the Malays in many districts Kudaayer, or river-horse. Though the flesh of the Indian tapir, like that of the American, is dry and disagreeable, and therefore of little value as an article of food, still the animal might be domesticated with advantage (and the same observation applies to the western species), and employed as a beast of draught or burden, its docility and great strength being strong recommendations. Its skin would prove, from its toughness, useful for various purposes.

THE FAMILY SUIDÆ, OR THE HOG TRIBE.

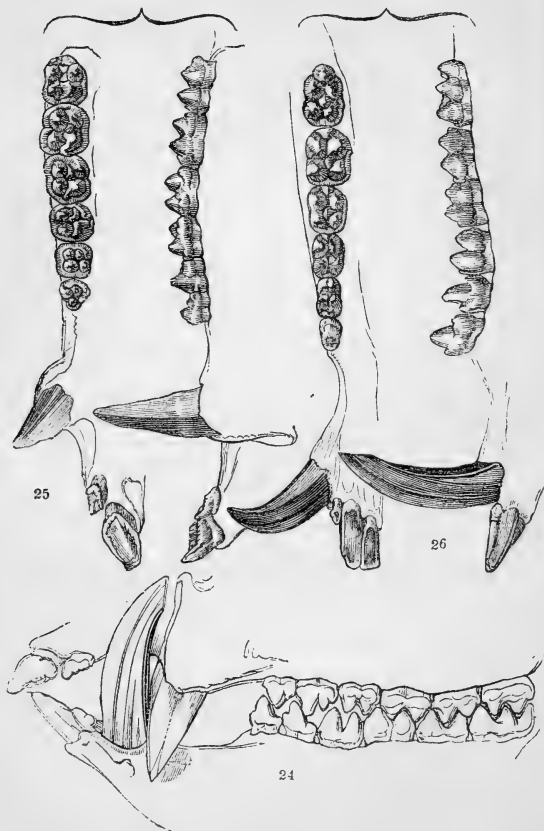
THE animals composing this family, of which the hog is the type, are distributed over Europe, Asia, Africa, and South America; it is indeed the only pachydermatous group the members of which are thus distributed. Viewed externally, the feet of these animals resemble those of the ordinary Ruminants, and may indeed be termed cloven; but the distinction is evident when we come to examine the bones. In the hog every toe (there are four on each foot) has its own metacarpal or metatarsal bone, and though the outer toe on each side is shorter than the two middle, still it is as perfect in conformation. The external similarity of the feet of the hog to those of the cloven-footed ruminants, and their real distinction, did not escape Buffon, though at the same time that celebrated philosopher was unable to discern the true affinities of this animal, and its real place in the scale of the mammalia. In the peccaries, however, it must be observed that the metacarpal bones of the two middle toes of the fore limbs and the corresponding metatarsal bones of the hind limbs are consolidated into a sort of cannon-bone, as in ruminating animals, while at the same time the stomach is divided into several distinct sacculi—an additional point of structural approximation to the ruminants.

The general external characters of the hog tribe need not be recapitulated here; all are familiar with them, as displayed by the ordinary tenant of the sty.

THE COLLARED PECCARY (*Dicotyles torquatus*).

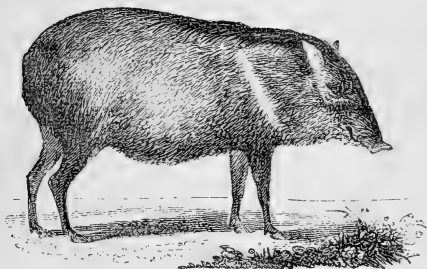
The Peccaries are the only indigenous representatives of the porcine group in America; the hog, which is now common there, being of recent introduction, though it wanders in wild herds.

The peccary closely resembles the hog in form and in the quality of the bristly hair which covers the body. It differs, however, from the hog in dentition, the incisors of the upper jaw being four instead of six, and the molars above and below on each side six; while the tusks,



24 to 26.—Teeth of Collared Peccary.

which are of moderate size compared with those of the hog, instead of taking a curve outwards, meet like ordinary canines; they are, however, sharp and effective weapons. Fig. 24 represents a lateral view of the teeth of both jaws; Fig. 25 those of the upper jaw in two views; and Fig. 26 those of the under. The limbs are more slender in proportion than in the hog, and there are only three toes on the hinder feet, the small outer toe being wanting. The tail is a mere tubercle: beneath the skin on the top of the loins is a large glandular apparatus, which pours out a secretion of disgusting odour. In their voice, their habits of rooting in the earth, the mode in which when angry they erect the bristles of the mane and clash their teeth, they resemble their porcine relative of the Old World.



27.—Collared Peccary.

The collared peccary is a native of the dense forests throughout the greater part of South America, and is usually met with in pairs or small families: they take up their abode in hollow trees and holes of the earth, where they seek a refuge from the pursuit of their enemies, of which, man excepted, the jaguar is the most destructive. Plantations of maize, sugar-canes, and potatoes often suffer from their incursions. It is only when hard pressed that the peccary defends itself: indeed it displays no-

thing of the sullen courage of the wild boar, but retreats on the appearance of danger, and precipitately seeks its hiding-place. (Fig. 27.)

Azara states that the Guaranis term this species Tay-tétou, and the white-lipped species Tagnicati. It is, he adds, domesticated with more facility than the wild hog, and becomes troublesome from its familiarity. "It is said, and I believe it, that their flesh is good, but not so fat as that of the hog; when killed, however, the glandular orifice between the haunches must be removed, since, if this be not done, the flesh acquires a bad odour and taste. Nevertheless the Indians eat it without this precaution." The inferiority of the flesh of the peccary to that of the hog, and its dorsal gland, will combine to exclude it from the European farm-yard. The collared peccary is about three feet in length, and is distinguished by a stripe of white or yellowish white passing from the withers down each shoulder and meeting on the throat. Its general colour is grizzled blackish gray; the bristles being ringed gray, straw-colour, and black.

The white-lipped peccary (*Dicotyles labiatus*) is larger than the collared species and more robust; it associates in vast troops directed by an old male; when attacked they surround the man, dog, or jaguar, and, if there be no means of escape, their enemy is soon torn to pieces. M. Schomburgk had a narrow escape from an infuriated herd, the leader of which he shot in the act of rushing at him: as the troop approached where he stood, the noise was like that of a whirlwind through the bushes; but the peculiar growl and awful clapping of the teeth," he adds, "did not leave me long in doubt as to its cause: it was evident the herd had divided, and were coming directly towards me: I know not yet how I climbed the lower part of a mora-tree, when by they rushed, their muzzles almost sweeping the ground, and their rough bristles on the back standing erect: they might have numbered fifty. They came and passed like a whirlwind; and before I had recovered from my astonishment, I heard them plunge into the river and swim to the opposite bank." Both species delight to wallow in the

mire and muddy pools, and readily take to the water, swimming with great vigour.

In captivity the white-lipped peccary has appeared to us to be more reserved and savage than the collared species, and more ready to testify by the clashing of its teeth its feelings of displeasure.

THE BABIROUSSA

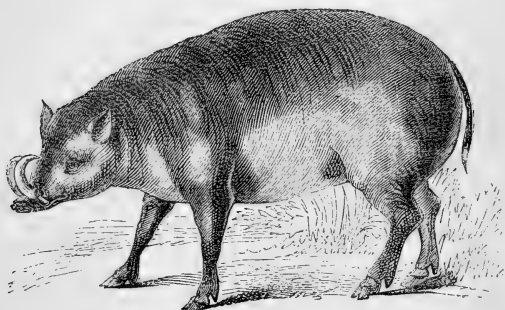
(*Sus Babirussa*, Linn.; *Babirussa alfurus*, F. Cuv.).

The term Babiroussa means literally hog-deer, and there is some reason to think that the ancients were not altogether unacquainted with the animal. Pliny notices a wild boar with horns on the forehead, found in India; and Cosmes, a writer in the sixth century, uses the term hog-deer (*χοιρελαφος*) as the designation of an Indian animal: however this may be, it is only recently that naturalists have become well acquainted with it and its habits, though its skulls have been brought over to Europe in abundance by vessels trading among the Moluccas.

The babiroussa differs somewhat in dentition from the hog, the incisors being four above, instead of six, and the molars five on each side in either jaw. The upper canines or tusks of the male emerge directly upward from their apparently distorted sockets, and sweep with a bold arch backwards, attaining to a very great length. The skin is thick, coarse, granular, of a blackish tint, and sparingly beset with very short bristly hairs. The tusks of the lower jaw are long, strong, and sharp, emerging like those of the boar. The tusks of the upper jaw do not pass out between the lips, but cut their way through the skin, nearly half way between the end of the snout and the eyes. The tusks of the lower jaw are formidable weapons. The male when adult equals the largest hog; the female is of much inferior size, and destitute of the curled upper tusks, or has them only rudimentary.

The babiroussa is found in the marshy forests in the interior of Bourou, and other of the Molucca islands, as Amboyna, and also Java, where it associates in troops. Its habits resemble those of the wild hog, and it is rest-

less and ferocious. According to Lesson it feeds chiefly upon maize, giving preference to that grain beyond other articles of diet. It is partial to the water, and swims with the greatest ease, often crossing the straits between adjacent islands without any difficulty. Some time since a pair of these animals were living and produced young in the menagerie of Paris. They were fond of nestling under the straw, and when the male retired to rest the female would cover him over with litter, and then creep under the straw to him, so that both were concealed. The following are notes which we made from a young male babiroussa living in the gardens of the Zool. Soc.:—This animal is hog-like in its figure, and much resembles a small pig of the Chinese breed. It is roundly



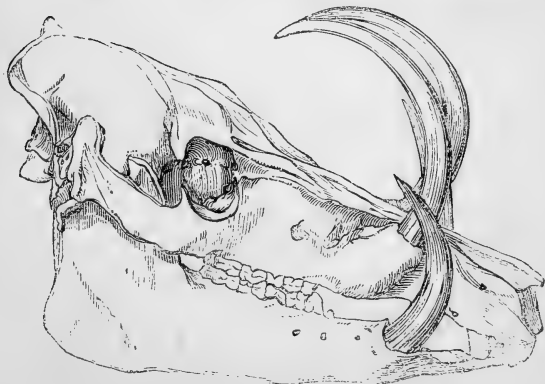
28.—Babiroussa.

formed, like a young well-bred hog, and the skin lies close, giving a compactness to its appearance. The head is small, and high between the ears; the snout is elongated; the ears are very small, erect, and pointed; the eyes in their form and expression resemble those of a stag; the iris is brown; the skin, which is thinly clothed with short black bristly hairs, is everywhere dotted with small granulations, which spread and become rougher, coarser, and more decided about the limbs and

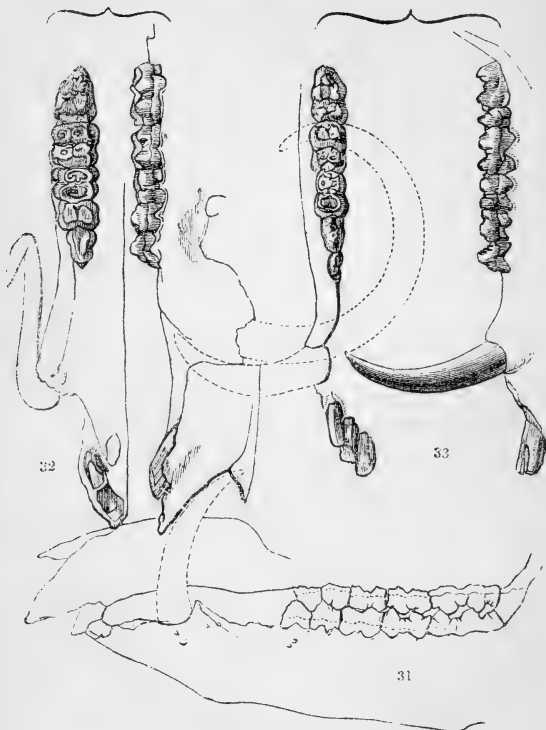
feet, and especially on the anterior part of the head and sides of the face and under jaw. (Fig. 28.) Closely as the skin lies, it becomes thrown into a series of regular and prettily arranged wrinkles or furrows with the different movements of the body, and varying in direction accordingly. As the animal turns to one side, these furrows are transverse; in other attitudes they become more or less oblique; but none are to be seen when the animal stands still or lies quietly on its straw. The tail is rather long, slender, and tapering; the limbs are well proportioned, and do not appear to be longer, in relation to the size of the body, than in the hog; the tusks of the upper jaw (in the present individual) are at present small, but curved back.



29.—Head of Babiroussa, seen in Profile.



30.—Skull of Babiroussa.



31 to 33.—Teeth of Babiroussa.

In its state of captivity this young babiroussa seems as contented as a pig in its sty, and it is not only quiet, but disposed to familiarity, raising itself up on its hind legs, and putting its snout to the bars of the enclosure, evidently soliciting food. It turns the straw over and over

with its snout, and champs in eating, but utters, as far as we could learn, no grunt, as does the hog, nor has it the unpleasant smell of the latter. That the babiroussa might be reclaimed, notwithstanding Lesson's account of its savage disposition in captivity, and added to our domestic animals, is very evident. Its flesh is reported to be held in high estimation. Fig. 29 represents the head of the male babiroussa (*a*) and of the female (*b*) by way of contrast. Fig. 30 is an admirable delineation of the skull of the adult male, in which the form of the tusks, their relative proportions and direction, are faithfully given. Fig. 31, a lateral view of the dentition of the upper and lower jaw. Fig. 32, dentition of the upper jaw, in two views; Fig. 33, those of the lower jaw.

THE WILD HOG

(*Sus Aper*, Briss. ; *Sus Scrofa*, Linn.).

The wild hog is, as all naturalists admit, the origin of our domestic race, but at what period it was reclaimed is very uncertain. The circumstances indeed connected with the domestication of every animal subject to the bondage of man are enveloped in obscurity. The domestication, however, of the wild hog would not involve much difficulty. Young individuals taken in their native forest soon become reconciled to captivity, and display the same contentment and familiarity which are so conspicuous in the ordinary tame beast. It is this disposition, a characteristic of the Pachydermata, which renders the elephant, the rhinoceros, the tapir, and others, so easily subjugated; but, on the other hand, the readiness with which they submit to the restraints of captivity is counterbalanced by an equal readiness to assume a life of independence. The hog when left to itself resumes its original habits, as is the case in America, where wild herds roam the forest; and, as we have seen, the elephant often escapes its trammels and joins its wild brethren, immediately submitting, if retaken, to the voice of authority which it had previously learned to obey. The

horse in a wild state scours the plains of Tartary and South America; it requires but a struggle to break in the most spirited. It may be laid down as an axiom, that the animals of whose services man stands most in need are, each in its way, those whose nature most readily induces them to submit to his dominion, nay, even to court his friendship. Some we can tame, and only tame; others we can educate.

The wild hog was once common in our island, and it is almost surprising, considering the passion for the chase which seems to be part and parcel of our English temperament, that this animal is not re-established in some of its old haunts, the parks and forests of nobility. In India, indeed, the chase of the wild boar is one of the field-sports to which our countrymen are enthusiastically devoted; nor is there any reason why it might not be revived in England.

The wild hog is still common in the forests of Germany, France, and other portions of Europe, and extends also through Asia and Africa; if indeed the species is positively identical—a point which there is some reason to question. At all events slight differences are observable between the Indian wild boar and the present breed of the German forests; and Sonnini expresses a doubt as to the identity of the Egyptian and European wild race.

In no essential point does the wild race of Europe differ from our domestic breeds; the snout however is more elongated, and, as might be expected, the contour of the frame is more gaunt and bony. The ears are short and erect, the tusks large, and the bristles long and coarse; the general colour is rusty black or blackish brown, more or less brindled in patches. After the age of three years the wild boar leads a solitary life in the forest, fearless of every foe and confident in his weapons, which, added to his great strength, render him a formidable antagonist. It is not, however, until the age of five or six years that he attains to his full dimensions, and the duration of his life is from twenty-five to thirty years. The females with their young associate in herds for the sake of mutual protection: on the approach of an enemy the young are placed in the centre, the old ones



34.—Female Wild Hog and Young.

forming a circle round them ; and should he be hazardous enough to venture on the attack, he meets with a rough reception. It is thus that the young are preserved from wolves, the chief foes to be dreaded by them ; to which in some districts they often fall a prey, notwithstanding the vigilance of their parent. It is only in defence of their young that the females are furious, but the old males are not to be approached without caution, and often rush out upon those who venture near the precincts of their

lair. At certain seasons, indeed, the wild boar is very savage, and should he meet a rival the most sanguinary combat ensues.

In the month of December or January each male attaches himself to the society of a chosen female, whom he accompanies in the deepest glens of the forest for about thirty days. When about to produce her young, the female seeks some undisturbed retreat remote from the haunts of the male, who, it appears, exhibits a propensity to devour her progeny if he discover the litter. (Fig. 34.) To her young the female is a most attentive mother; she suckles them for three or four months, and they remain with her for a long time: an aged female is sometimes seen followed by several families, among which are some of the age of two or three years. These young rovers the French hunters call *bêtes de compagnie*. The wild boar seldom stirs from his lair during the day, and may therefore be regarded as in some degree nocturnal; on the approach of twilight, he rouses from his indolent slumbers, and sets out in quest of food, which consists of acorns, beech-mast, grain, different vegetables, and roots; in search of the latter, he ploughs up the ground with his snout: corn-fields in the vicinity of forests where wild hogs exist often suffer extensively from their nightly incursions. The wild boar, though not truly carnivorous, does not refuse animal matters which chance may throw in his way: he does not however ordinarily attack and kill others for the sake of their flesh, but only devours what he may meet with in his rambles. In the morning the wild boar returns to his lair in the thickest and most gloomy part of the forest, under a rock, in a cave, or under the canopy of gnarled and intertwined branches. When roused by the hunter and his dogs, the old boar retreats sullenly and slowly, gnashing his teeth, foaming with anger, and often stopping to receive his pursuers, on whom he often rushes with sudden impetuosity, striking with his tusks, goring dogs and men, and scattering terror around. When the boar turns upon a pack, the foremost dogs are sure to suffer, and several will fall by as many strokes. (Fig. 35.) An



35.—Boar-hunt.

instance is on record in which a boar turned suddenly upon a pack of fifty dogs which pursued him, and instantly despatched six or seven of them, wounding all the rest, with the exception of ten. The young boar is less resolute than the old animal, and will run to a considerable distance before he is brought to bay; nor is the assault attended with any great degree of danger. In all ages the chase of the boar has been a favourite diversion; the classic writings abound with allusions to it and to the risk incurred. Ovid (Fab. iv., lib. viii.) gives a spirited account of the chase, in which the fury and strength of the enraged beast are admirably depicted. It would seem that the ancients endeavoured to enclose the boar by nets so as prevent his escaping into the recesses of the forest: the combat was close and therefore dangerous; driven from his lair by the dogs, and hemmed in, the infuriated animal turned savagely upon his assailants, and died, after killing and wounding dogs and men, transfixed by spears and javelins. Our forefathers in the Middle Ages deemed the wild boar one of the noble "beastes of venery," and kept a powerful breed of hounds for the chase: the weapons used by the hunters were spears, and a sort of short sword, or *couteau de chasse*; the spears were used when the boar was brought to bay, and the attack gave abundant opportunities to the hunters of showing their skill and courage. The loud blast of the horn, mingled with the shouts of men and the baying of the hounds, proclaimed the vigorous home-thrust that struck the savage lifeless to the ground. Figs. 35 and 36 are illustrative of the boar-hunt as conducted in Europe in the Middle Ages. Fig. 37 illustrates boar-hunting as practised in India at the present day. The hunters are always mounted on horseback, and, instead of meeting the animal with spears, attack him with javelins, which are launched at him as he flies, or as he rushes to the charge, which is often so determined that the horses cannot be brought to stand the shock, or, if they do, are thrown down and gored; serious accidents sometimes occur. Mr. Johnson relates an instance in which a large and resolute boar, after



35.—Bear-hunt.

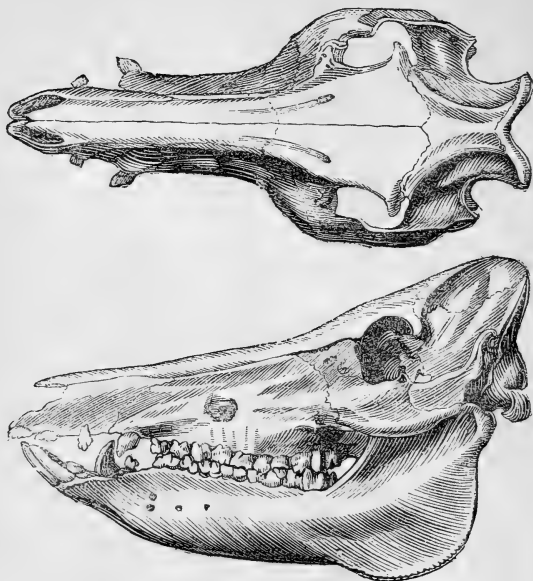
being driven by the hunters into a plain, stood at bay and challenged the whole party: he charged every horse that advanced within fifty yards of him, with great ferocity, causing them to rear and plunge, and throw off their riders, whose lives were in jeopardy: though many of the horses were accustomed to the sport, none would stand his charges, or bring the rider within javelin distance, and at last he fairly drove the party from the field; and then, gnashing his tusks and foaming, he made his way to the jungle, where it was useless to attempt to follow him.

In our own country the boar, reserved for the sport of the privileged classes, was protected by severe laws. By one of the edicts of William the Conqueror (A.D. 1087), it was ordained that any who were found guilty of killing a stag, roebuck, or wild boar were to have their eyes put out: sometimes, indeed, the penalty appears to have been a painful death.

At what precise period the wild boar became extinct in our island cannot be exactly determined; it is evident, however, that as population increased, and the vast woods which spread over many parts of the country were cut down and the land cleared, the range of the boar would become more and more limited, and its numbers decreased, till at length its extirpation would be complete. We look in vain for the forest which, in the 12th century, covered the country to the north of London, and of which Fitzstephen, in the reign of Henry II., writes, observing that "on the north are corn-fields and delightful meadows, intermixed with pleasant streams, on which stands many a mill, whose clack is so grateful to the ear; beyond them an immense forest extends itself, beautified with woods and groves, and full of the lairs and coverts of beast and game, stags, bucks, boars, and wild bulls." Banished, however, as the wild boar is from among our native mammalia, "its name is immortalised," as Mr. Bell observes, "by having given origin to the appellation of many places in different parts of the country, and by its introduction into the armorial bearings of many distinguished families of every division of the kingdom."



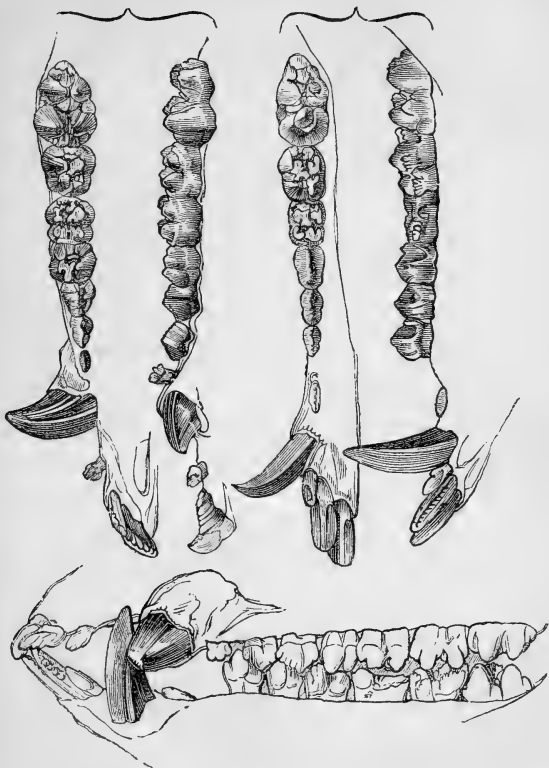
37.—Boar-hunting in India.



38.—Skull of the Hog.

The skull of the hog (Fig. 38,) which affords an index of the habits of the animal, is of a conical or wedge-like form; the base or occipital portion forms a right angle with the oblique upper surface, and a bold transverse ridge is formed by the union of the occipital and parietal bones. The nasal bones are prolonged nearly to the end of the snout, which, in the living animal, terminated in a moveable cartilaginous disc, pierced by the nostrils. The lower jaw is of great strength. The dentition

(Fig. 39) is as follows:—Incisors, $\frac{6}{6}$; canines, $\frac{1-1}{1-1}$;



39.—Teeth of the Hog.

molars, $\frac{7-7}{7-7} = 44$. The canines of the upper jaw are

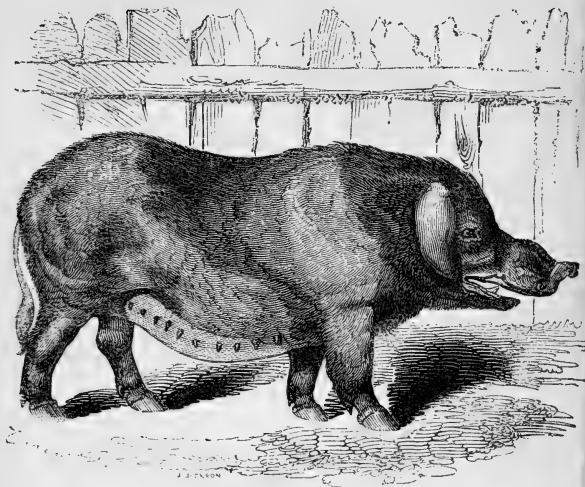
prismatic, and curve downwards, having their anterior surface worn by the action of the huge canines of the lower jaw, which are sharp, sweep out from the sides of the mouth, and often attain to the length of eight or ten inches, and sometimes even more. These canines or tusks are terrible weapons: rushing on his antagonist, the boar strikes obliquely upwards, right and left, with prodigious violence; a mode of action the best calculated for bringing these weapons into effective play, and in which the muscular powers of the neck and shoulders are the most advantageously and naturally exerted.

THE DOMESTIC HOG

is too well known to need any description; and its utility too well appreciated to require comment. It is not, however, valued alike in all countries, and in some is regarded with abhorrence. In India both Brahmin and Mussulman reject its flesh as food, yet in many districts of that country semi-domesticated hogs wander about the villages, feeding on the refuse which they pick up in the streets. Colonel Sykes states that in Dukhun "every village abounds with hogs, but any property in them is equally abjured by individuals and the community." Detestation of the hog was a feeling entertained by certain nations in remote antiquity. It was classed by the Jews among the vilest animals, and in Egypt the swineherd was numbered among the profane, and forbidden to enter the temples of their gods; even the lowest dregs of the people refused to bestow their daughter on him in marriage. The Egyptians sacrificed the hog to Bacchus, and to the moon when full. "In the evening of the festival of Bacchus," says Herodotus, "though every one be obliged to kill a hog before the door of his house, yet he immediately restores the carcase to the swineherd that sold him." The ancient Scythians, according to the same authority, made no use of swine, nor suffered any to be

kept in the country. The Abyssinians and the Copts of Egypt, as well as the Mohammedans, reject the flesh of the hog. Among the ancient Greeks and Romans, though the office of swineherd appears to have been held in contempt, the flesh of the hog was in high estimation, and a sucking pig was as favourite a dish as amongst ourselves in the present day. The Chinese have derived no prejudices against the hog from the Mohammedan nations of the East: on the contrary, they rear these animals in great numbers for the sake of their flesh; and even the numerous population who tenant the floating town of rafts or barges contrive to keep and rear them.

“One of the most singular circumstances,” says Mr. Wilson, “in the domestic history of this animal, is the immense extent of its distribution, more especially in far-removed and insulated spots inhabited by semi-barbarians, where the wild species is entirely unknown. For example, the South Sea Islanders, on their discovery by Europeans, were found to be well stocked with a small black-legged hog; and the traditionary belief of the people in regard to the original introduction of these animals showed that they were supposed to be as anciently descended as themselves. Yet the latter had no knowledge of the wild boar or any other animal of the hog kind from which the domestic breed might be supposed to be derived.” (‘Quarterly Journal of Agriculture.’) Among our Saxon forefathers the hog was of great importance: its flesh was a staple article of consumption in every household, and a great portion of the wealth of the farmers and landed proprietors consisted of droves of swine, which were attended by swineherds, thralls, or bondslaves, and which were driven into the woods of oak and beech, in order to feed on acorns and mast, and all the while guarded from the attacks of the wolf. The domestic hog of that period appears to have closely resembled, in form and colour, the wild species; and the old unimproved breed, now seldom seen, may be regarded as its modern representative. (Fig. 40.) There are now in our island several breeds of this useful animal,



40.—Domestic Hog.

of acknowledged excellence, the result of judicious crossings. The test of excellence is productibility, a readiness to become fat, small bone, and the quality of the whole animal when converted into bacon: size is of minor importance. The introduction of the small Chinese breed is one great source of improvement. The Chinese hog is short in the head, with sharp neat ears, low on the limbs, and high in the chine. It is very prolific, and fattens readily. The prevailing colours are black or half black and half white. This breed, or one closely allied to it, extends from China throughout various groups of islands in the Pacific.

The breed nearest to the Chinese in this country is the Suffolk: these are generally white; they are compactly made, and deep in the chest.

Another source of improvement is the Neapolitan hog : this is a plump animal of a black colour, without any hair, and with a singular predisposition to become fat : it is however of a tender constitution. The pure black breed of Essex, which has very little hair, is closely allied to it, and when crossed with the Neapolitan produces a most valuable stock : a cross between the Neapolitan and Berkshire breed is also in high esteem. A breed between the Berkshire, Chinese, and Neapolitan may, by careful selection, produce every quality which can be desired : great fecundity, an early acquisition of fat, and moderate size, with admirable form and proportions.

The domestic hog is by no means destitute of intelligence, and little deserves the character of a stupid filthy brute, as some are pleased to call it. As regards filthiness, everything will depend on its keeper : it is true that, like the elephant and hippopotamus, it delights to wallow in the mire ; but no animal more luxuriates in clean straw, and when it is styed up in filth justice is not done to it. The hog is a " huge feeder," but so are the horse and ox, and a fat hog is a more comely-looking beast than one that is lean and ill-fed. With respect to intelligence, we rank it far before the ox and horse, though it is less docile. In Minorca it is used to draw the plough, and works well ; and Pennant says that in the district of Murray, between the Spey and Elgin, it was formerly employed for the same purpose, and that a credible eye-witness informed him " that he had seen in his parish there, a cow, a sow, and two young horses yoked together and drawing a plough in light sandy soil, and that the sow was the best drawer of the four." The senses of taste, smell, and hearing are possessed in great perfection by the hog : it is a saying among a certain class of persons that pigs can smell the wind ; they are certainly aware of the approach of a storm, and we have seen them agitated during its continuance, screaming, and running about with straw in their mouths, or carrying it to their sty as if to add to their shelter. In Italy advantage is said to be taken of the sense of smell with which this animal is endowed in searching for truffles

and in our own country the famous sow Slut was broke in to the gun, and stood to her game as stanch as the best pointer.

The genus *Sus* as at present constituted contains, besides the common wild hog and its domestic relatives, two other species known to naturalists: of these one is the Papuan hog, or Bêne of the natives of New Guinea (*Sus Papuensis*), figured and described in the 'Zoologie de la Coquille,' by MM. Lesson and Garnot. It is remarkable for its small size, and its light and agreeable proportions, and the shortness of the tusks. It is common in the forests of New Guinea, where it is esteemed by the native Papuans as delicate food: they contrive to catch these animals when young, and rear them in a state of domestication.

The other animal is the Woodswine of South and Eastern Africa, and of Madagascar, the Bosch-Vark of the Dutch colonists of the Cape (*Sus larvatus*, Cuv.). This savage and formidable animal resembles the wild boar of Europe, but its head is larger in proportion, its snout broader, and an elevated callous protuberance is seated on the cheeks between the tusks and eyes, giving a revolting aspect to the physiognomy. Prompt and vicious, the Bosch-Vark is much to be dreaded in combat, its strength and the size of its tusks rendering it a match for almost any foe. It dwells in excavations in the ground, where it is dangerous to attack it, as it rushes out suddenly from its retreat and deals rapid destruction among its assailants. Dr. Smith observes that this species is subject to great variety of colouring, scarcely any two specimens being precisely alike: some are of a brownish black variegated with white, and others are of an almost uniform light reddish brown or rufous without white markings; and it is scarcely possible to say which is the most prevailing style of colouring. The bristles are long, particularly upon the upper parts of the neck and back; the canines are of huge size and strength: the ears are short, and thinly covered both without and within with coarse black hair, which is longest at their tips. The tail is thinly covered with black bristles. Average

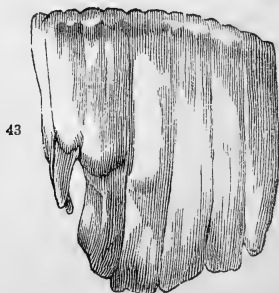
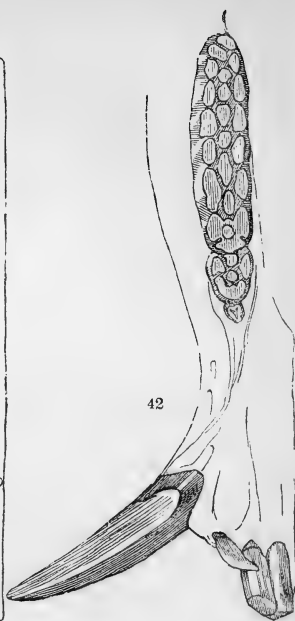
length of body, between four and five feet; of the tail, one foot.

The discovery of the bones of an extinct hog of huge size in the cavern of Sundwick in Westphalia is due to M. Goldfuss. Bones of three distinct species occur in the Epplesheim sand (Miocene division of tertiary deposits, Lyell), and fossil relics of a species have been found in Hutton Cave, in Mendip, and in other places.

Several species of an extinct genus (*Chæropotamus*) closely allied to the hog have been discovered in the gypsum of Montmartre, in certain strata in Switzerland, and in the Eocene formation of the Isle of Wight, &c.

GENUS PHACOCHÆRUS.

The animals contained in this genus resemble the hog in manners, form, and aspect, so that, were it not for the peculiarity of their dentition, they would necessarily be included in the genus *Sus*. Their dentition, however, is so different from that of the hog as to justify their separation. Instead of presenting the ordinary structure, the grinders have a great analogy with those of the elephant: they are composed of vertical cylinders of enamel enclosing an osseous deposit, and are cemented together by cortical substance, or crusta petrosa. It is long before the root of these teeth is perfected, and they advance in rotation from behind forwards, pushing before them the first molars, which in old individuals are found to be either greatly reduced or to have entirely disappeared. It is not till after ceasing to push forward that the roots become consolidated. With regard to number, they appear to vary. In the skull of the Abyssinian Phacochoere (*Ph. Æliani*, Rüpp.), which we have carefully examined, the molars were found to be four on each side above, and three below. From the first molar above, which was very small, to the third, the increase in size was gradual, but the fourth molar was long and narrowed gradually as it proceeded backwards. Had the animal lived much longer, it is probable that the first molar



41 to 43.—Teeth of Phocachœre.

would have disappeared: the dentition would then have been as represented in Fig. 41. The incisors were two above and six below. The tusks were enormous. It would seem that the presence of incisors is variable; for in the South African species they either do not exist or are undeveloped. Cuvier states that vestiges of them are sometimes found under the gum; but in specimens from Cape Verde the incisors are generally complete.

Fig. 41 is one side of the upper jaw of the South African Phacochoere: Fig. 42, one side of the lower jaw of the Cape Verde species: Fig. 43, a lateral view of the last molar tooth, which may be compared with the molar of the elephant.

The head of these animals is enormously large and heavy; the eyes are small and set high on the forehead, which is depressed between them; under each eye is a large coarse fleshy lobe; and a warty excrescence appears on each side of the muzzle, between the eye and the tusks. The muzzle is very broad, and the ears are erect.

THE SOUTH AFRICAN PHACOCHÆRE

(*Phacochoerus Æthiopicus*, F. Cuvier),

or Vlacke Vark of the Cape colonists. The phacochoere found in Guinea, at Cape Verde, and along the Senegal, is regarded as distinct from the present species by F. Cuvier, in consequence of the possession of incisors; and is termed by him *Ph. Africanus*. The range of the South African phacochoere, or Vlacke Vark, does not appear to be precisely determined; formerly it existed within the limits of the Cape colony, and still lingers on the frontier districts, but is much more common in the remoter latitudes. In the frontier districts these animals seldom venture to seek their food during the day: but in the countries inhabited by natives who are destitute of the efficient arms of the colonists they are at all times to be met, though their favourite feeding-times are early in the morning, late in the evening, and even during the night, if it be moonlight. When disturbed in its retreats,

and especially when hunted, the Vlacke Vark is a very dangerous animal ; for though it will not turn out of its way to give chase, yet, if brought to bay, or forced to extremity, it attacks with furious impetuosity, and strikes with its tusks, which are dreadful weapons : it has been known to cut with one stroke completely through the fleshy part of a man's thigh. We learn that, though this animal is used as food by the colonists, the Hottentots, and Bechuanas, it is rejected by the Coast Caffres, who are much more particular as to what they eat than any other natives of South Africa, and consider as an inferior class the persons who consume as food the articles which they hold as prohibited. The top of the head, the upper part of the neck, and the anterior part of the back are covered with very long and rigid bristles of a black-



44.—African Boar.

brown colour, those on the top of the head diverging like the rays of a circle. On the other parts the hair is shorter and of a dull brown, slightly inclined to white on the belly and flanks. The tail, except along the top, where it is furnished with a number of blackish brown bristles, is nearly naked. Length of head and body, about five feet; of the tail, about eleven inches. (Fig. 44.)

Sparrman, who was well acquainted with this species during his residence in South Africa, gives us a good account of its habits and manners, whence it would appear that the young and the females associate in herds, for the sake of mutual defence, as is the case with the wild swine of Europe. In the tenth chapter this accurate writer says, "This day I saw for the first time a herd of *boschvarkens*, or, as they are likewise called, *wilde varkens* (wood swine or wild swine), in their wild uncultivated state; for I had hitherto seen only one of this species of animals in the menagerie at the Cape. He was confined there with a strong iron chain, and was very wild and vicious. M. Pallas informs us in his 'Spicel. Zool.,' Fasc. xi. add. p. 84, that one of them killed the keeper of the menagerie at Amsterdam. One may easily conceive that this creature is very dangerous, if one only takes notice of its large tusks. . . . In a head of this animal, salted and dried, which I gave to the Royal Academy of Sciences in Sweden, the upper tusks stand nine inches out of the jaws, and measure full five inches in circumference at the base. The two other tusks which come from the lower jaw project but three inches from the mouth, being flat on the inside, and corresponding with another plain surface similar to it in the upper tusks. These the beasts make use of not so much for biting as for goring and butting with. A little pig of this species which I afterwards caught at *Visch rivier*, and had tied up, thinking to bring it alive along with me, had already got this trick, so that I was soon obliged to let it be killed. It was terribly vicious, and quick in all its motions; and though at that time not absolutely dangerous, yet my Boshies men were very much afraid of it. 'We had rather,' said they, 'attack a lion on the

plain than an African wild boar; for this, though much smaller, comes rushing on a man as swift as an arrow, and, throwing him down, snaps his legs in two, and rips up his belly before he can get to strike it and kill it with his javelin.' . . . The dwelling-place of this same species of wild boar, to which the avenues seemed to be very narrow, is under ground. I have been told indeed that the *boschvarkens* go down into them backwards, and place themselves there in a row one behind the other; but this is not very likely, for probably these passages are widened lower down. Thus much, however, is certain, that people dare not attack them in their holes, for fear of their coming out on them on a sudden. The body of this animal is small in comparison with its head, a conformation which facilitates its burrowing and living underground.

"It would not be advisable for a man on horseback to approach too near or to hunt this animal, as it will often turn round on a sudden, and, striking with its tusks at the horse's legs, afterwards kill both him and his rider.

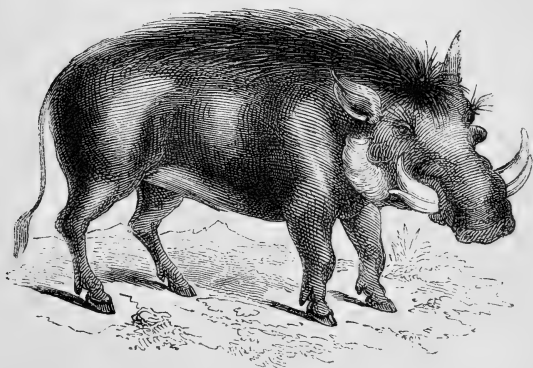
"This day I pursued several young pigs with the old sows, with a view to shoot one of them, but in vain; nevertheless the chase of them afforded me peculiar pleasure. On a sudden, the heads of the old ones, which before were of a tolerable size, seemed to have grown still larger and more shapeless than they were before; which momentary and wonderful change astonished me so much the more, as my hard riding over a country full of bushes and pits had hitherto prevented me from giving sufficient attention to the manner in which it was brought about. The secret, however, consisted in this: each of the old ones, while they were making off, took a pig in its mouth; a circumstance that also explained to me another subject of my surprise, namely, that all the pigs which I was just before chasing along with the old ones vanished all on a sudden. In this action we find a kind of unanimity among the wood-swine, in which they resemble the tame species, and which they have in a greater degree than many other animals. It is very

astonishing that the pigs should be carried about in this manner between such large tusks as those of their mothers, without being hurt or crying out in the least. I saw the same done, however, on two other occasions, as I was chasing them. The cry of their young was like that of our common pigs, as I found in some we afterwards caught."

THE ABYSSINIAN PHACOCHÆRE

(*Ph. Æliani*, Rüppell).

This species was found by Rüppell first in Kordofan, but afterwards in greater abundance on the eastern slope of Abyssinia. It haunts low bushes and forests, and has a habit of creeping on its bent fore limbs in quest of food. In this attitude, it uses its tusks in digging up or tearing out of the ground the roots of plants, which constitute part of its diet. When thus engaged it pushes its body forwards by means of its hind legs, in order to move along. This habit of kneeling to feed has been observed in the species from Cape Verde. We have occasionally noticed it in the common hog. (Fig. 45.)



45.—Abyssinian Phacochære.

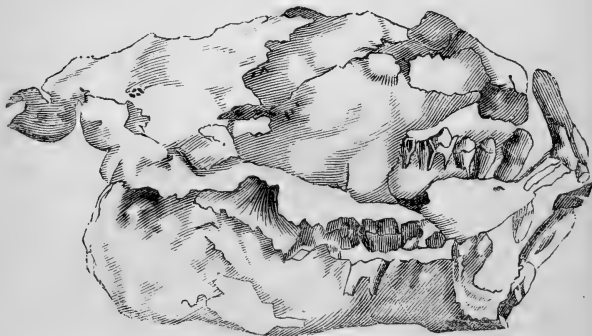
Genus EQUUS.

Of this genus we have already treated in a separate volume, and we therefore pass on to extinct fossil species of this order.

EXTINCT FOSSIL SPECIES

SKULL OF THE FOSSIL ADAPIS.

To the order *Pachydermata* Cuvier refers an extinct animal, of which the remains have been found in the plaster-quarries of Montmartre. The remains, however, are very rare, and we believe that only three fragments of skulls have been recovered. The adapis was evidently a small animal, its skull being only about a third larger than that of a hedgehog. There were four incisors,



46.—Skull of Fossil Adapis.

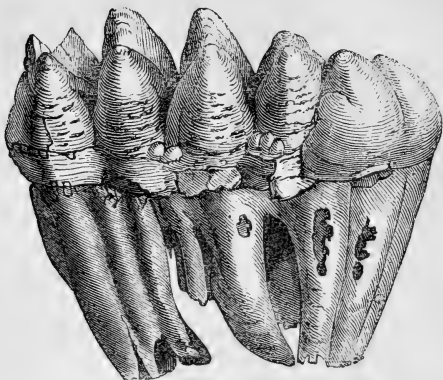
sharp-edged and oblique, in each jaw, followed by a canine tooth of a conical form and not exceeding the molars in length. Of these latter there were seven on each side, in each jaw. In the upper jaw the first molar was trenchant, the second and third surrounded

by a small ridge, the last four flat-crowned. In the lower jaw the first three molars were pointed and trenchant, the remainder flat-crowned and tuberculous, like those above opposed to them. (Fig. 46.) Of the genus, *Dichobunes* contains three species, *D. leporinum*, *murinum*, and *obliquum*: the first about the size of a hare; the other two, of a guinea-pig. They appear to have had much of the form, and probably of the habits, of the little musk-deer, or chevrotains.

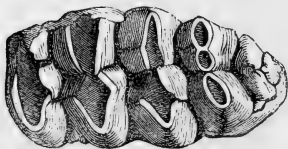
THE MASTODON.

Coexistent perhaps with the mammoth, a race of huge animals, now utterly extinct, once tenanted our globe: their remains, which are met with in the superficial strata, occur in some localities in great abundance; and, from the differences presented by the teeth and other parts, several species have been identified. To these animals Cuvier gave the title of *Mastodon*, in allusion to the principal character of the molars, which, instead of being formed, as in the elephant, of transverse laminæ, have the crown of simple structure, but exhibiting ranges of bold conical elevations, divided from each other by deep furrows. (Fig. 47.) As the points of these elevations become worn down by use, the crown presents a series of lozenge-shaped lines of thick enamel (Fig. 48), but when these are quite obliterated the surface becomes uniform and concave.

Of the molars thus characterised there were two above and below on each side; but before these molars it would appear that in young individuals others had been situated, and had fallen in succession, as Cuvier satisfactorily ascertained from the examination of various specimens. With regard to the mode of succession in the grinders of the mastodon, it takes place, says Cuvier, by a movement from behind forwards. When the back tooth is in the act of piercing the gum, that anterior to it is worn and ready to fall, and they thus replace themselves one after the other. It does not appear that it is possible for more than two at a time on each side to be



47.—Molar of Mastodon, not worn.



48.—Molar of Mastodon, much worn.

in full operation, and ultimately, as in the elephant, there is only one. That the mastodon had tusks like the elephant is proved by the large alveoli for their reception. As no perfect skull of the mastodon is known, it is impossible to define its contour: it must, however, have had a general resemblance to that of the elephant, inasmuch as the tables of the frontal bone are separated in a similar manner by extensive cells.

The neck is short, and the skeleton generally (Fig. 49) approximates to that of the elephant. The masto-



49.—Skeleton of Mastodon.

don must have possessed a proboscis, as is evident from a consideration of the structure of the skull and skeleton,—and indeed it would appear that this proboscis has not in every instance been completely decomposed. The relics of the *Mastodon giganteus*, or “animal of the Ohio,” are found in North America, especially in saline morasses, and to this circumstance Barton thinks is to be attributed the occurrence of soft parts still capable of being made out. In 1762 (as he states) out of five skeletons which were seen by the natives, one skull still possessed what they called a “long nose” with the mouth under it. Kalm, speaking of a huge skeleton, which, in accordance with the ideas of his time, he believed to be that of an elephant, and which was discovered by the savages in the country of the Illinois, says that “the form of the trunk (bec) was still apparent, though half decomposed.” Of the several species of this extinct genus the Great Mastodon, or animal of the Ohio, is the most remarkable. Its relics appear to be confined to the American continent: they are distributed very generally, and are accumulated in some places in considerable abundance, but nowhere so much so as in that saline morass popularly termed the Big-bone Lick. They are found buried in the mud, and along the borders of the morass, at the depth of four feet and upwards, together with the bones of buffaloes, stags, &c. These relics have no appearance of having been rolled, and in some places, as for example along the Great Osage River, they are found in a vertical position, as if the animals had sunk down into the mud, which had closed over them. The ferruginous matter with which the bones are impregnated, says Cuvier, is the main proof of their long repose in the earth.

The traditions which were rife among the Red Men concerning this gigantic animal and its destruction must not be passed over in silence. M. Fabri, a French officer, informed Buffon that the savages regarded these bones scattered in various parts of Canada and Louisiana as belonging to an animal which they named the *Père aux Bœufs*. The Shawnee Indians believed that with

these enormous animals there existed men of proportionate development, and that the Great Being destroyed both with thunderbolts. Those of Virginia state that, as a troop of these terrible quadrupeds were destroying the deer, the bisons, and the other animals created for the use of the Indians, the Great Man slew them all with his thunder, except the Big Bull, who, nothing daunted, presented his enormous forehead to the bolts, and shook them off as they fell, till, being at last wounded in the side, he fled towards the great lakes, where he is to this day.

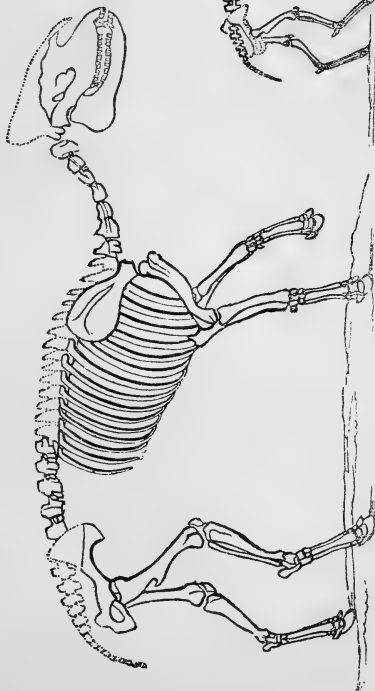
Besides the *Mastodon giganteus*, the following species are distinguished: *M. Angustidens* (Europe, America?), *M. andium* (Andes), *M. Humboldtii* (Concepcion—Chili), *M. minutus*, *M. tapiroides*, *M. Turicensis*, *M. Avernensis* (Epplesheim, Puy-de-Dôme), *M. elephantoides* (Irawaddi, Sewalik Mountains), *M. latidens* (Irawaddi, Sewalik Mountains), and *M. longirostris*, Kaup. Professor Owen has referred the teeth from the Norfolk crag to the last-named species.

THE PALÆOTHERIUM.

In the gypsum-quarries near Paris and in various parts of France have been discovered the fossil relics of a group of Pachydermatous animals, to which Cuvier gave the title of *Palæotherium*. Ten or eleven species are recognised, varying from the size of a rhinoceros to that of a hog. The most immediate alliance of these fossil forms is to the tapir, and they perhaps take an intermediate station between that animal and the rhinoceros. The bones of the nose prove that the Palæotheria must have been furnished with a short proboscis; the toes were three in number on each foot: the dentition consisted of 6 incisors in each jaw; canines, as usual; and 7 molars on each side above and below.

Figs. 50 and 51 represent respectively outlines of the *Palæotherium magnum* and *Palæotherium minus*, as restored by Cuvier; Figs. 52 and 53 represent the skeletons of the same animals; Fig. 54 is an imperfect skull of *Palæotherium magnum*; Fig. 55 shows the characters

50.—Outline of *Palæotherium magnum*.51.—Outline of *Palæotherium minus*.



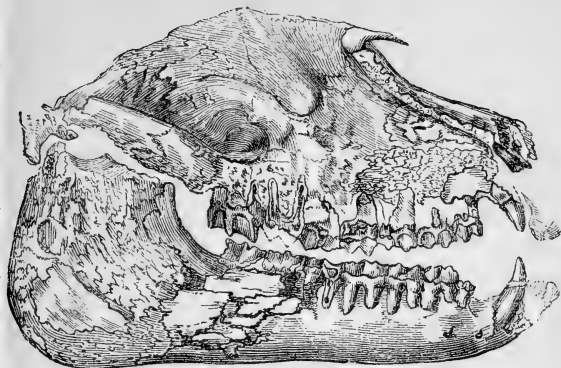
52.—Skeleton of *Palæotherium magnum*.



53.—Skeleton of *Palæotherium minus*.

of the molar teeth of the upper jaw ; Fig. 56, the lower jaw and molar teeth, imperfect.

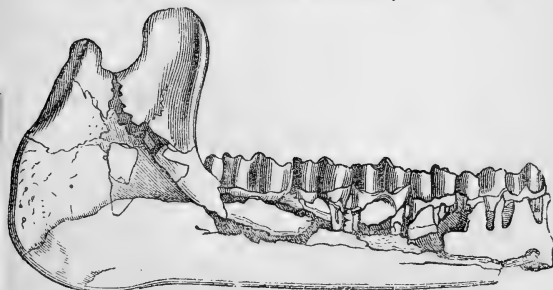
The restoration of the skeletons of these extinct forms is one of the triumphs of science ; and, by persons unacquainted with the law of harmonious dependence which reigns throughout the structure and organization of animal bodies, might be deemed an improbability, or at least, an uncertain process : not so—the bones of the feet, the teeth, the spine, or of the limbs, are to the comparative anatomist a foundation upon which he can rear a superstructure, a clue to the recomposition of the fabric. Speaking of the accumulated stores of fossil relics at his command, Cuvier thus writes:—" I at length found myself, as if placed in a charnel-house, surrounded by mutilated fragments of many hundred skeletons of more than twenty kinds of animals piled confusedly around me ; the task assigned to me was to restore them all to their original position. At the voice of comparative anatomy every bone and fragment of a bone resumed its place. I cannot find words to express the pleasure I experienced in seeing, when I discovered one character, how all the consequences which I predicted from it were successively confirmed. The feet accorded with the characters announced by the teeth ; the teeth were in harmony with those indicated previously by the feet. The bones of the legs and thighs, and every connecting portion of the extremities, were seen joined together precisely as I had arranged them before my conjectures were verified by the discovery of the parts entire. Each species was, in short, reconstructed from a single unit of its component elements." The relics of the Palæotheria are found mingled with those of many other extinct forms in a stratum of fresh-water formation, as is evidenced by the shells it contains : it is the first of the great fresh-water formations of the Eocene period of Lyell, a deposit in which nearly fifty extinct species were discovered by Cuvier. We cannot doubt but that, like the tapir and rhinoceros of the present day, the Palæotheria frequented the borders of lakes and large rivers, feeding upon the leaves and twigs of brushwood : there



54.—Skull of *Palæotherium magnum*.



55.—Molar Teeth of Upper Jaw of the same, seen from above.

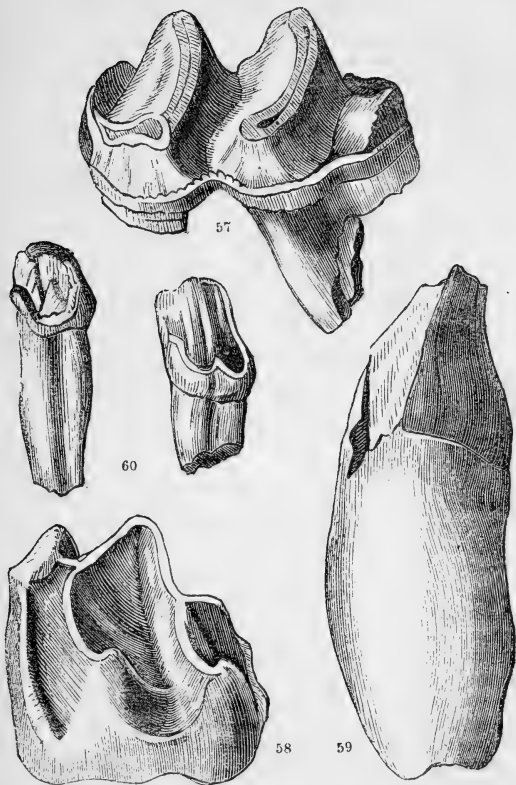


56.—External View of part of the Lower Jaw of the same.

they lived and died; their dead carcasses drifted to the bottom of the lake, swept off from the shore in seasons of flood, when the swollen rivers cleared the adjacent lowlands of hosts of dead, and perhaps also of the living, hurrying them to destruction, and depositing their relics, to be in other ages brought to light, the "*reliquia vetustioris ævi*."

THE LOPHIODON.

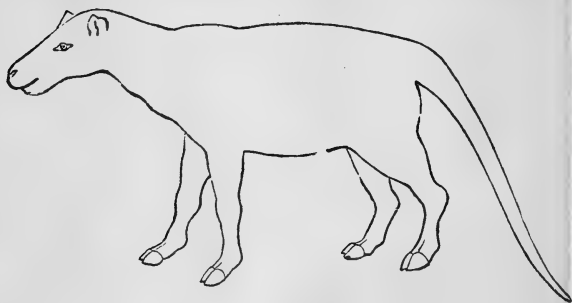
Another fossil genus allied to the tapirs is termed by Cuvier *Lophiodon*: not less than fifteen species are determined; and they are found in the same fresh-water formation as the Palæotheria. The dentition of the *Lophiodon* differs from that of the last-named animals, the lower jaw having only six molars. The teeth in character approach those of the rhinoceros. Fig. 57 represents a lower back molar of the gigantic *Lophiodon* of Argenton; Fig. 58, an upper back molar; Fig. 59, a canine tooth; Fig. 60, two incisor teeth: all of the same species. With many essential parts of the osteology of these extinct animals naturalists are as yet unacquainted; the bones of the nose, for example, and those of the feet, are not recovered. The remains of the *Lophiodons* found at Issel, Argenton, Bucksweiler, Montpellier, Montabusard, &c., occur in beds of fresh-water formation, but below those superficial strata containing the bones of the mammoth and mastodon. They are associated with the relics of forms of terrestrial animals of which we have no living prototypes, and with those of crocodiles and fresh-water tortoises. The antiquity of these beds may be inferred from the fact that in most places they are covered by strata of decidedly marine formation, so that the *Lophiodon* existed and passed away not only before the races had commenced whose remains are found (and found only) in the alluvial strata of the earth, but before the extinction of still older races; they belong in fact to strata of our continent over which, after becoming consolidated, the sea has rolled, and remained long enough to cover them with rocks of a new origin.



57 to 60.—Teeth of Lophiodon.

THE ANOPLOTHERIUM.

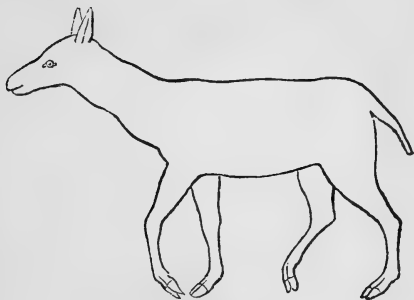
Our figures give Cuvier's restoration of the outlines of two species of the extinct group of Pachydermata termed Anoplotherium, the fossil relics of which, mixed with those of the Palæotherium, occur in the gypsum-quarries near Paris, and also, though more rarely, in the neighbourhood of Orleans and Genoa. These Anoplotheria are remarkable for the characters of their dentition; the teeth consist in each jaw of six incisors, two canines, and fourteen molars, reckoning both sides together; and these are arranged in a continued and uninterrupted series; without any vacancy between the incisors and the canines, or between the canines and the molars. The canines resemble the incisors in form, and might be



61.—Anoplotherium.

mistaken for them; the four posterior molars are like those of the rhinoceros. The feet are cloven as in the deer, being divided into two toes, sheathed with a hoof at the extremity; in the deer and other Ruminants the metacarpal and metatarsal bones are blended into a single canon-bone, but in the Anoplotherium they are separate as in the hog. Allied to the Pachydermata in some points, and in others to the Ruminantia, the Anoplotheria

appear to have occupied an intermediate station between these two great orders: their heads, judging from the skull, partook of the form of that of the horse and of the camel; the snout was not elongated into a proboscis as in the tapir or the elephant. The Anoplotheria are divided into three subgenera, on various minor details of structure. The restricted division Anoplotherium Proper comprehends two species, viz. *A. commune* (Fig. 61), about the size of the ass, and the *A. secundarium*, about the size of the hog. These animals were low on the limbs, and probably resembled the tapirs in their habits, but were furnished with a long tail compressed horizontally at the base, and rendering them more essentially aquatic: they resorted to lakes and marshes in search of aquatic plants, and, as the flattened form of the tail indicates, must have swum and dived with greater ease than either the hippopotamus or tapir.



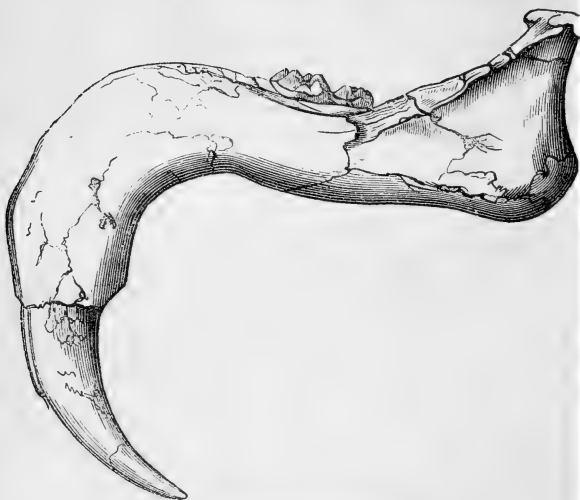
62.—Anoplotherium.

The subgenus *Ziphodon* contains but a single species (*A. gracile*: Fig. 62), a light, slender, graceful creature, with much of the contour of the gazelle: it was probably fleet and active, and was confined to the dry land, where it fed like the deer. The tail was short, and in this respect and in its general figure, as the

skeletons prove, it must have exhibited a complete contrast to the low-built, heavy *Anoplotherium commune*. Of the third sub-general outline of the *Adapis* we have as yet no means of arriving at any idea.

THE DINOTHERIUM

(*D. giganteum*), as restored by Professor Kaup. Cuvier, from teeth and isolated fragments, gave, in his work on fossil bones, the title of “*Tapir gigantesque*” to the huge animal of which they were the relics, the only ones



63.—Lower Jaw of Dinotherium.

then discovered. It was reserved for Professor Kaup to add to our knowledge of the animal in question, by the discovery first of several lower jaws (Fig. 63), and subsequently of the skull (Fig. 64), which were found

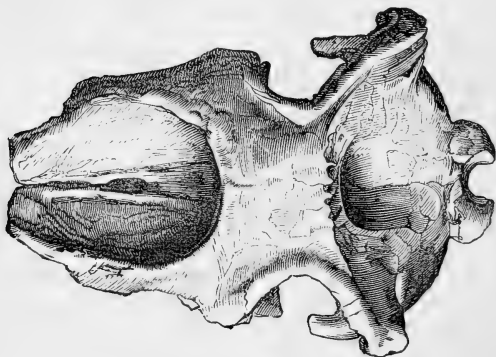


64.—Skull of Dinotherium.

imbedded in a stratum of sandstone (the second or Miocene system of tertiary deposits) at Eppelsheim, about twelve miles south of Mayence, in company with relics of the following, viz.: a second species of dinotherium, making the species 2: Tapirus, 2, larger than living species; Chalicotherium (allied to tapirs), 2; Rhi-

noceros, 2; Tetracaulodon (allied to mastodon), 1; Hippotherium (allied to horse), 1; Sus, 3; Felis (some as large as a lion), 4; Machairodus (allied to bear, *Ursus cultridens*); Gulo (glutton), 1; Agnotherium (allied to dog, but as large as a lion), 1.

Cuvier, before he had completed the last edition of his 'Règne Animal,' became aware of M. Kaup's discovery of the lower jaw, and in his Additions, vol. i. p. 581, he alludes to this fragment as affording data for the separation of the "Tapir gigantesque" into a distinct genus. To this genus M. Kaup has given the title Dinotherium. The skull of this extraordinary animal is more than a yard in length, and the size and situation of the nasal orifice (Fig. 65), with the salient portion of



65.—Skull of Dinotherium.

the short nasal bones, indicate the probable possession of a proboscis; we say probable, because in the manatee or lamantin, and also the dugong, we have a similar extent and situation of the nasal orifice, a circumstance militating against the inference that a proboscis necessarily accompanies this conformation of the skull. Indeed

the general aspect of the skull of the dinotherium, setting aside the tusks of the lower jaw, and its strange alveolar projection, strongly reminds us of that of the lamantin (*Manatus*, Cuv.). The orbits themselves are very small, but the temporal fossæ are very deep and extensive, indicating the great mass of the temporal muscle. The lower jaw is most remarkable. It is armed at the extremity with two enormous tusks (incisors), which, instead of projecting upwards or forwards, sweep

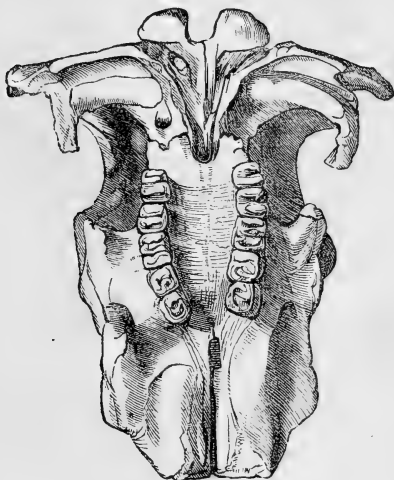


Fig. 66.

downwards, and curve gently backwards, having their roots imbedded in enormous alveoli. The dentition is as follows:—Incisors, $\frac{0?}{2}$; canines, $\frac{0-0}{0-0}$; molars, $\frac{5-5}{5-5} = 22$.

Of the molars the third has three transverse ridges across its surface, the others have two, with the exception of

the first molar of the lower jaw, which has only one at its posterior part, the anterior portion being trenchant. Fig. 66 represents the palatal view of the skull of the dinotherium; Fig. 67, the molar teeth and the relative bearing of the two rows, which approximate towards each other anteriorly.

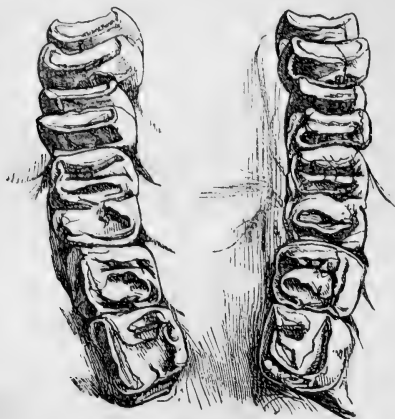


Fig. 67.

The situation and affinities of the dinotherium have been the subject of much speculation, and very opposite opinions have been entertained by different naturalists. M. Kaup, influenced by the discovery of huge claws and a scapula, resembling in character those of the Pangolins (*Manis*), assigns the animal to the Edentata, but differing from all extant species not only in exceeding the elephant in size, but in having, like the elephant, a proboscis. Dr. Buckland regards the dinotherium as approximating to the tapir, of aquatic habits, and furnished with a proboscis, by means of which it conveyed to the mouth the vegetables raked from the bottom of

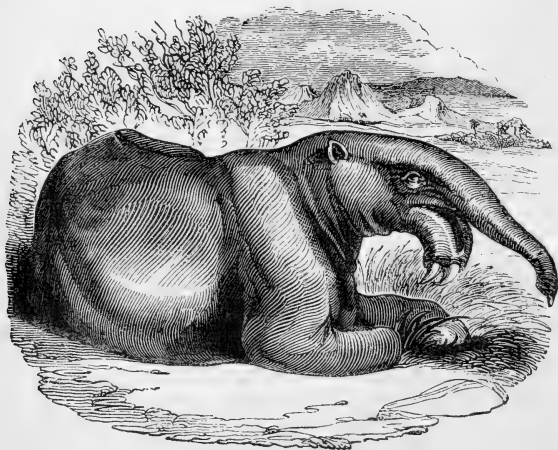
lakes and rivers by its tusks and claws; and he alludes to its claw resembling that of the Pangolins. MM. Blainville and Duméril consider the dinotherium to have been allied to the lamantins, or "aquatic gravigrades,"—to have been in fact a dugong with tusk-incisors, and therefore one of the concluding forms of the Pachydermata. They consider that it had no proboscis, but a huge inflated muzzle and upper lip. Gæger places it with the seals. Now, as regards M. Kaup's theory, we may at once state that the claws and scapula on which he founds it are not proved to belong to the dinotherium; and he himself admits that, should the discovery take place of other fossil relics whence the certain existence of a *Manis gigante* might be presumed, his theory would be overthrown. Our own opinion coincides with that of M. Blainville. The occipital condyles (see the posterior view of the skull seen from below, Fig. 68, and



Fig. 68.

the skull Fig. 64) are terminal, or in the direction of the longitudinal axis of the skull, as in the lamantins, and also the cetaceous mammalia modified for aquatic existence. The occipital surface is large, subvertical, and even inclined from before backwards, with a profound mesial depression for the insertion either of a very strong cervical ligament or powerful muscles for the elevation of the head. The basilar portion of the skull (Figs. 66, 67) is narrow in its component parts, while the vertical surface (Fig. 64) is, as in the lamantins and dugongs,

very wide, overplumbing the temporal fossæ, of which the depth and width indicate the enormous levator muscles of the lower jaw, not only for the purpose of mastication, but for the particular action of the lower jaw, with its rake-like tusks. Moreover, in the lower jaw we find an analogy to that of the dugong, of which the branches curve downwards for a third of their length to a deflected symphysis, only that in the *dinotherium* this downward curvature is carried to a far greater extreme, for the implantation of tusk-incisors. What were the limbs of this gigantic animal? If its habits were terrestrial, which a consideration of the skull forbids us to believe, the *dinotherium* must have had solid pillars of support, like the limbs of the elephant, and destitute of that liberty which even in the Pangolins they are endowed with; but if our ideas are correct, its limbs

69.—*Dinotherium*.

were adapted for aquatic locomotion, and perhaps the posterior pair were wanting, or formed the elements of a terminal paddle. Its diet was undoubtedly vegetable, as in the dugong; and we may conceive it tearing up the strong-fibred vegetables from their subaquatic bed by means of its tusks, which might serve also as weapons of offence, or as anchors for the purpose of mooring itself to the banks of the lake or river, or of dragging its unwieldy body partially out of the water. (Fig. 69.)

Dr. Buckland informs us that bones of the dino-therium have lately been found in tertiary fresh-water limestone near Orthes, at the foot of the Pyrenees, and with them remains of a new genus allied to rhinoceros, of several unknown species of deer, and of a dog or wolf equalling a lion in size.

Cuvier and Kaup calculate the length of the dino-therium at about eighteen feet; the massive lower jaw measures nearly four feet, exclusive of the tusks.

FOSSIL SKULL OF TOXODON (*Toxodon Platensis*, Owen).

We are inclined to refer the toxodon, of which an imperfect skull and fragments of a lower jaw, and some teeth, are our only guides, to the aquatic Pachyderms; and, as in the instance of the dino-therium, we draw our deductions from the weight of the skull, from the form and position of the nasal aperture, the slope of the occiput, and the position of the occipital condyles.

The skull in question was brought by Mr. Darwin from South America. It appears that during his sojourn in Banda Oriental he heard of some giant's bones at a farm-house on the Sarandis, a small stream entering the Rio Negro, about 120 miles north-west of Monte Video. Accordingly there he rode, and for the sum of eighteen-pence purchased the cranium now in the museum of the Royal College of Surgeons, London. Mr. Darwin was informed by the people at the farm-house that the relics were exposed in consequence of a flood having washed down part of the bank of earth. When first found the skull was perfect; but unfortunately the boys of the

neighbourhood knocked out the teeth with stones, and set up the head as a mark to throw at. Mr. Darwin, however, found a perfect tooth, and fragments ascertained by Professor Owen to be those of the lower jaw. These remains were so fresh as to render it difficult to believe that ages had passed since their interment; and Mr. Darwin observes that they contained so much animal



Fig. 70.

matter, that, when a portion was heated in the flame of a spirit-lamp, it not only exhaled a very strong animal odour, but burnt with a slight flame. The deposit in which they were imbedded was a whitish argillaceous earth, forming the banks of the Sarandis, overlying a granitic foundation.

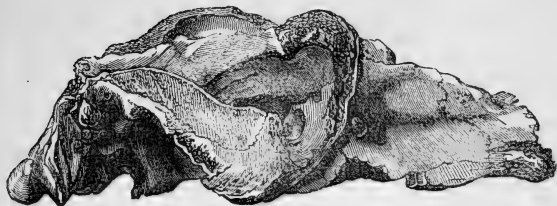


Fig. 71.



Fig. 72.

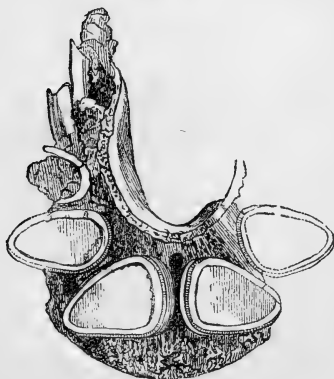


Fig. 73.

The skull in question equals in size that of the hippopotamus, measuring two feet four inches in length, and one foot four inches in extreme breadth. The form of the skull (Figs. 70, 71) is elongated and depressed; the zygomatic arches are of enormous size and strength, an index of the great volume of the temporal and masseter muscles. The occipital region (Fig. 72) slopes from the condyles upwards and forwards. The maxillary portion of the skull is compressed laterally, narrow across, and with large intermaxillary bones, slightly dilated at their extremity. The superior part of the skull was cavernous, with cells, or sinuses, giving to it greater apparent volume than the cerebral cavity would lead us to infer. According to Professor Owen the

dental formula is as follows: Incisors, $\frac{4}{6}$; canines none, a vacant space being in their place; molars, $\frac{7-7}{7-7} = 38$.



74.—Incisor of Lower Jaw of Toxodon.

The incisor teeth (see Fig. 73, the fragment of the anterior part of the lower jaw, with the teeth *in situ*; and Fig. 74, an incisor of the lower jaw) are remarkable for their resemblance in many respects to those of the Rodents; they were rootless, and had persistent pulps; growing, therefore, as worn down by use. In the upper jaw the two central incisors were very small; the two

external ones very large, curved, with their sockets extending back in an arched direction through the intermaxillary bones to the maxillary, and terminating, without becoming contracted, immediately anterior to the grinding teeth. In the lower jaw the two middle incisors are largest, the rest gradually diminishing in size. (Fig. 73.) The molar teeth also were rootless, and curved, whence the name *toxodon* (τόξον, a bow, ὀδοῦς, a tooth); and their grinding surface presented one or more folds of enamel re-entering the osseous substance of the centre, as in Rodents. See Fig. 77, the last molar teeth but one of upper jaw; Fig. 78, the grinding surface of the same; Fig. 79, the grinding surface of the corresponding molar of lower jaw.

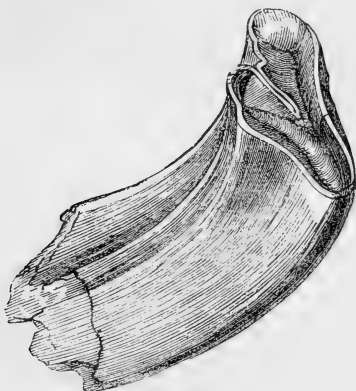


Fig. 77

We might here enter on many minutæ, and follow Professor Owen through his anatomical details, were it not that they are rather adapted for the close attention of the comparative anatomist than the general reader. Those who wish to gain the fullest information on these

points we may refer to the 'Proceeds. Geol. Soc. Lond.' 1837; and the 'Zoology of the Beagle: Fossil Mammalia.' We may observe, however, that "in the aspect of the plane of the occipital foramen and occipital region of the skull, in the form and position of the occipital condyles, in the aspect of the plane of the bony aperture of the nostrils, and in the thickness and texture of the osseous parietes of the skull," the toxodon manifests an affinity to the dinotherium and the aquatic Pachyderms (the herbivorous Cetacea of Cuvier, but which in manners and organization have little relationship to the true whales, excepting as far as they are all modified for the waters of the deep).



Fig. 78.



Fig. 79.

With respect to the limbs of the toxodon, we have as yet no evidence respecting their form or number; how far, therefore, they were constructed for aquatic progression, whether for this solely, or for occasional visits to the land, is yet a problem to be solved. Professor Owen, however, suggests that the presence of large frontal sinuses renders it not improbable that the habits of this species were not so strictly aquatic as the total absence of hinder extremities would necessitate.

In speaking of the dinotherium and toxodon it will be seen that we have referred them, with the lamantins and dugongs (more properly duyongs), to the aquatic Pachyderms, between which group and the ordinary Pachyderms we regard the hippopotamus as forming a

link, though decidedly within the pale of the latter. Cuvier has remarked that such of the Pachydermata as approach the Ruminants in the structure of their feet partake in some degree of the complication of the stomach which in the animals of the latter order is so remarkable a character; and it may be said, *per contra*, that such Pachyderms as approach in a certain degree in habits to the aquatic group resemble them in the structure of the same organ. The stomach of the semi-aquatic hippopotamus, for example, consists of certain sacculi, which renders it analogous to that of the lamantin. Sir E. Home observes that "the stomachs of the manatee and hippopotamus bear a close resemblance to each other in structure, and are in many respects similar to that of the peccary, which is a variation of the hogs, to which the tapir is also allied; and these circumstances throw no small light upon the preparatory processes required for the digestion of different kinds of vegetable food.

The grass of the field is the food of ruminating animals, and, from the structure of their digestive organs, it is evident that much previous digestion is necessary for its preparation. The grass and weeds at the bottom and on the banks of rivers is the food of the manatee and hippopotamus, and the apparatus formed for preparing these substances displays an approach to the stomachs in Ruminants. In the hog tribe the resemblance is less, those animals having a more indiscriminate diet; the structure of their stomach shows that grass is by no means their natural food. The stomachs of the manatee and hippopotamus, then, which at first sight appear so extraordinary and incomprehensible, are in fact the links which unite the Ruminants to those animals which feed on roots and various vegetable substances, and form a key, without which the different gradations cannot be satisfactorily explained."

It is not only in the form of the stomach, but in the structure and contour of the skull, the position of the eyes and nostrils, and even in the nature of the skin, with its subcutaneous layer of fat, that we trace the approximation of the hippopotamus to the lamantins; and

it may be that the toxodon, and even dinotherium, form links between the lamantins and hippopotamus, being within the pale of the group to which the former belong.

We may here observe, that the number of fossil genera included within the Pachydermata greatly exceeds that of genera containing living species, of which latter many, as *Equus*, *Elephas*, *Rhinoceros*, and *Hippopotamus*, have fossil as well as living species: so that the number of fossil or extinct species already ascertained of the Pachydermatous order, taken collectively, is far greater than the number of living species. In some, perhaps many, instances the affinities of the fossil Pachyderms are not understood, fragments of bones only having been recovered: in some instances they cannot be mistaken.

We began our observation on the Pachydermata by alluding to the unfilled intervals between the forms now living on the surface of the earth, and a statement that in fossil forms—some yet to be discovered, others to be made out, and, as it were, re-constructed—would the lost links in the chain be recovered; and we again express our opinion that ultimately the work will be, if not perfectly, at least to a great extent, accomplished.

That our ideas are not unreasonable we have from time to time satisfactory proofs. Sir Thomas Mitchell has recently transmitted from Australia some fossil bones which incontestably prove the existence of at least one gigantic Pachyderm, at some remote period, in that region. These fossils consist of a portion of a molar tooth, of the shaft of a thigh bone, with part of the spine, of a scapula, and some smaller fragments of a long bone. They were found on the Darling Downs, those extensive plains marked to the south-west of Moreton Bay on most maps of Australia, at the source of the river Darling, and upwards of 4000 feet above the level of the sea. Sir Thomas Mitchell, in his letter to Professor Owen, to whom the relics were forwarded, states that these huge bones are found in some abundance. It would appear from Professor Owen's examination, that

this huge extinct animal was allied both to the mastodon and dinotherium. Fig. 80 represents the femur of this extinct Australian Pachyderm—*a*, its transverse section ; Figs. 81, 82, two views of the portion of a molar tooth of the same. These fossils, now in the museum of the Royal College of Surgeons, cannot, observes Professor Owen, be contemplated without suggesting many interesting reflections.

“They tell us plainly that the time was when Australia’s arid plains were trodden by the hoofs of heavy Pachyderms ; but could the land then have been, as now, parched by long continued droughts, with dry river-courses, containing here and there a pond of water ? All the facts and analogies which throw light on the habits of the extinct mastodons and dinotheres indicate these creatures to have been frequenters of marshes, swamps, or lakes. Other relations of land and sea than now characterize the southern hemisphere, a different condition of the surface of the land and of the meteoric influences governing the proportion and distribution of fresh-water on that surface, may therefore be conjectured to have prevailed when huge Mastodontoid Pachyderms constituted part of the quadruped population of Australia. May not the change from a humid climate to the present particularly dry one have been the cause, or chief cause, of the extinction of such Pachyderms ? Was not the ancient Terra Australis, when so populated, of greater extent than the present insular continent ? The mutual dependencies between large mammalian quadrupeds and other members of the animal kingdom suggest other reflections in connection with the present fossil. If the extinct species ever so abounded as to require its redundancy to be suppressed by a carnivorous enemy, then some destructive species of this kind must have co-existed, of larger dimensions than the extinct *Dasyurus lanarius*, the ancient destroyer of the now equally extinct gigantic Kangaroos, *Macropus titan*, &c., whose remains were discovered in the bone-caves of Wellington Valley. Extremely few coprophagous beetles have hitherto, we believe, been found in Australia ; and the scarcity of

Fig. 80.

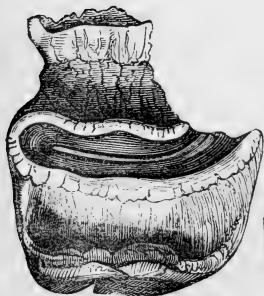


Fig. 82.



Fig. 81.

such is readily explained by the absence of native species of large herbivorous mammals; but the dung of the mastodontoid quadrupeds which formerly existed in Australia must then have afforded the requisite conditions for a greater abundance of such *coleoptera*. These and other speculations are naturally suggested by the highly interesting fossils here described. The great importance of such organic remains will be obvious from the few inferences which have been briefly noted; our obligations to the enlightened collector and transmitter of the mastodontoid fossils are great, and the arrival of additional facts and specimens will be most earnestly welcomed."

A consideration of the fossil relics of extinct animals throws the mind back upon remote periods before the surface of our globe had acquired its present aspect, its present arrangement of land and water, of mountains and plains, islands and continents; and when we begin to review the history of its phases, we find ourselves carried back into the obscure of time, till—in comparison with the ages which have passed since the commencement of the Primary period, wherein those oldest rocks were formed in which there are no traces of animal or vegetable life, to the conclusion of the Secondary geological period—the date of man's existence on the globe seems but of yesterday, and the few thousand years through which he has played his part sink into a span.

But though the vast antiquity of the globe is clearly demonstrated, still the length of time which has elapsed during the formation of the whole or of any definite portion of the crust of the earth is a problem yet to be solved. We know that at one period life had no place on our planet. The gneiss and mica-schist systems of strata of the Primary period are destitute of all trace of organic remains. In these, the most ancient of rocks, which exhibit to us the combined effects of igneous and aqueous agency, no fossil relics speak of a Fauna or Flora during their formation, and we may believe that few or none of the organised wonders of nature were then in existence, because the physical conditions of the

globe requisite for the existence of animals and plants were not then established.* How long did this state of the earth continue? It is a question which cannot be answered. Passing from the primeval rocks,

“Where the bird dared not build, nor insect wing
Flit o’er the herbless granite,”

we come to the Snowdon rocks of argillaceous slate, and the calcareous and argillaceous rocks, constituting the Cumbrian system, in which a few traces of organic life have been detected, but of organic life in its lowest type. Then the Silurian or transition system succeeds, consisting of sandstones, limestones, and shale; here corals, crinoidea, trilobites, terebratulæ, &c., all belonging to extinct species, and often to extinct genera and families, and all aquatic, are abundant. From these systems of the primary strata, we advance to the secondary strata—rich in oceanic life—divided into the carboniferous system, the saliferous or new red-sandstone system, the oolitic system, and the cretaceous or chalk system. The deposits constituting each of these systems are replete with organic remains, but all of extinct species and often of extinct genera. The coal-measures are rich in an extinct Flora, principally consisting of ferns, often in an extraordinary degree of preservation, the most delicate leaves being spread out, and so arranged as to constitute a beautiful Hortus Siccus of a long-past period. About 300 species of plants have been discovered in the coal-measures of this and other countries. Their luxuriance indicates a genial temperature and a humid ground. “It would hardly be credited,” says Professor Lindley, in his ‘Fossil Flora of Great Britain,’ “by persons unacquainted with the evidence upon which such facts repose, that in the most dreary and desolate regions of the present day there once flourished groves of tropical plants, of Coniferæ, like the Norfolk Island and Arau-

* We exclude microscopic animalcules from our consideration, because at present we scarcely know under what circumstances they can live.

carian pines, of bananas, tree-ferns, huge cacti and palms; that the marshes were filled with rush-like plants 15 or 20 feet high, and the coverts with ferns like the undergrowth of a West India island.

The chalk system is rich in extinct corals, zoophytes, and echinoderms. Our lofty chalk hills and the white cliffs of Dover have been formed through a long succession of ages at the bottom of a deep sea. From the Secondary we advance to the Tertiary periods. In general, says a talented writer, "No contrast can be more complete than that between the secondary and the tertiary rocks; the former retaining so much uniformity of character, even for enormous distances, as to appear like the effect of one determined sequence of general physical agencies: the latter exhibiting an almost boundless local variety, and relations to the configuration of land and sea not to be mistaken. The organic bodies of the secondary strata are obviously and completely distinct from those of the modern land and sea; but in the tertiary deposits, it is the resemblance between fossil and recent kinds of corals, shells, plants, quadrupeds, and other vertebrata, which first arrests the judgment. In general there is a decided break between the two groups of rocks, a discontinuity which is nowhere completely filled. Yet besides the pseudo-tertiary or transition chalky rocks of Maestricht and the Pyrenees, and the conchiferous marls of Gosau, we have in England and France above the chalk a prevalence of green and ferruginous sands similar to those below. Perhaps they have been derived from the waste of those older rocks. Mr. Lyell supposes the tertiaries of the London basin to have been formed from the waste of the secondary strata of Kent, Surrey, Sussex, and Hampshire. With the tertiary system came into existence, if we may trust the evidence which the earlier strata present, many races of quadrupeds, some birds, reptiles, and fishes, extremely analogous to, though for the most part specifically distinct from, the modern denizens of land and water; thousands of corals, shells, crustacea, &c., which present with living races quite as great analogy as obtains be

tween the tribes of the Atlantic and the Pacific oceans of our day. The general features of land and sea as they now exist began to appear, and there can be no doubt that in a philosophical study of the revolutions of the globe the tertiary era of geology cannot be properly separated from the existing system of nature." The tertiary period, taken in this extended sense, saw the creation and extinction of the mammoth, the mastodon, the palæotherium, the fossil rhinoceros and hippopotamus, the dinotherium, the toxodon, and the huge pachyderm of Australia; and next, the creation of all our modern races of animals.

During the period of the deposition of the tertiary strata, the relations of land and sea were greatly altered in various portions of the globe; in Europe by the rising of the Pyrenees beyond the height they reached after the cretaceous era, and by the uplifting of the Alps from the Mediterranean towards Mont Blanc. "In England we may believe the upward movement of the southern counties connected with the Hampshire axis of elevation and the Isle of Wight convulsion was ended at an early epoch of the tertiary period. The eastern range of the Alps from Mont Blanc to Vienna is of later date, and may be viewed as the most marked phenomenon of elevation which accompanied or preceded the dispersion of erratic blocks in Europe."

Besides the alterations thus produced in the relation of the land and the sea, changes have taken place, and are still in progress, from other causes. Rivers bring down vast quantities of the disintegrated particles of the strata through which they flow, and deposit the sediment at their mouths, forming deltas, or low tracts, won as it were particle by particle from the domain of the ocean; on the other hand, the sea itself wears down coasts to a great extent, making vast inroads on the land, and converting the isthmus into an island: sometimes, by the sudden or gradual elevation of a large tract of land, an inland sea becomes drained, leaving in its place a sandy desert. In the depths themselves there is no rest; multitudes of zoophytes and testacea there live and die,

there their remains accumulate layer upon layer, forming beds of vast thickness, which at a future day may be laid bare, covered with alluvium, and engage the researches of another Cuvier. The chemical action of the atmosphere; heat and cold, rain and snow, winds, springs, rivers, torrents, the action of the tides; life, animal and vegetable; and volcanic agencies, all contribute their part to alter the surface of the land, and to effect changes in its relative extent to that of the sea—changes which are in reality never stationary, but, imperceptible as they may seem, in constant progress.

The deposits of the Tertiary period are divided by Mr. Lyell into three series: the oldest, or Eocene, in which there occurs from three to five per cent. of existing species of shells; secondly, the series of the middle age, or Miocene, averaging 18 per cent. in the occurrence of existing species of shells; and thirdly, the superficial or Pleiocene deposits, in which the ratio of existing shells is from 40 to 95 per cent.

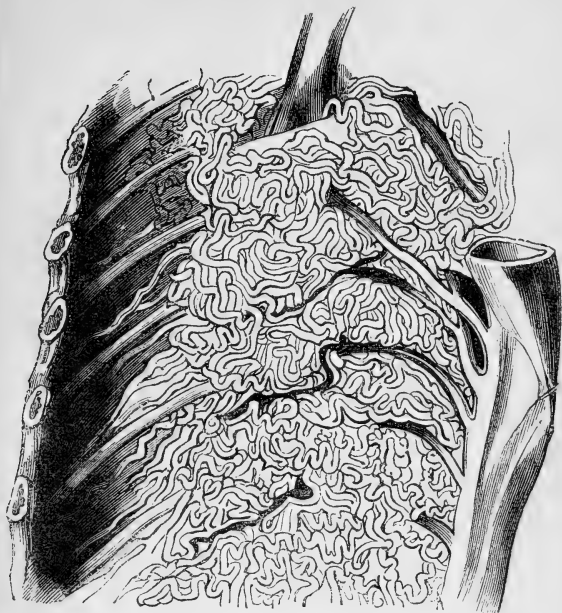
We trust we shall be pardoned for this brief digression, into which we were led by a desire to show that fossil relics are not all of the same era, and that Primary, Secondary, and Tertiary periods have each their distinguishing characteristics, their own fossil relics; that on the whole the progression of life has been from the lowest aquatic forms, to forms analogous to those now tenanted the earth, which, when they existed in the Eocene, Miocene, or Pleiocene epoch of the Tertiary period, must have presented to a certain extent the superficial features it at present exhibits, though there were doubtless great modifications in the arrangements of land and water, and in the temperature of given latitudes. We beg to refer our readers to the articles 'Organic Remains' and 'Geology,' in the 'Penny Cyclopædia.' The perusal will give additional interest to our details of fossil relics.

Tribe—AQUATIC PACHYDERMATA

(The *Herbivorous Cetacea* of Cuvier).—If our readers will turn to our account of the fossil *dinotherium* and

toxodon, pp. 104 and 111, he will find that we have there alluded to the dugong or duyong, and the lamantin (the Aquatic Gravigrades of Blainville), as belonging to the pachydermatous order, and as having in manners and organization little relationship to the true whales, excepting in so far as they are alike modified for the waters of the deep.

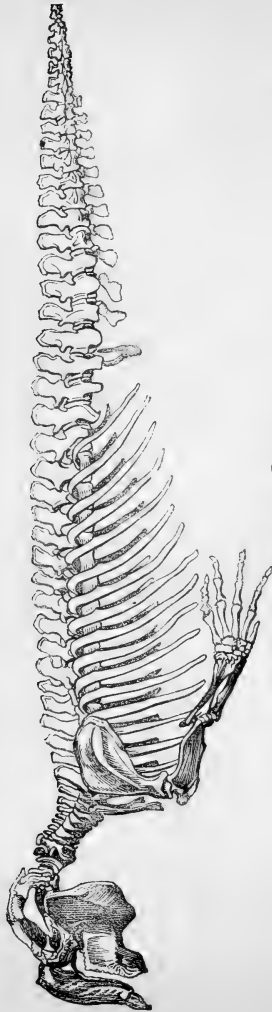
In their external form, indeed, these aquatic pachyderms are whale-like: there are no hinder limbs, the pelvis being either rudimentary or wanting, and the fore limbs are converted into flippers or paddles; the body is continued conical till it terminates in a transverse or horizontal tail, consisting of an expanse of cartilage covered with tendinous fibres and skin, and which is the chief organ of aquatic locomotion. The skin is almost naked, oily, and covers a layer of subcutaneous blubber or fat; the lips are studded with thick wiry bristles. Although the nasal opening is placed high on the skull, the nostrils in the skin are placed at the extremity of the muzzle, which is remarkably obtuse and truncate—a form advantageous for the browsing habits of these animals, which feed on submarine vegetables. The eyes are protected by a membrana nictitans, and the teats in the females are situated just behind the roots of the flippers—two points of difference between these aquatics and the whales. The stomach is sacculated; the teeth present flat bruising surfaces; there are no intercostal and intra-vertebral arterial plexuses, as in the true Cetacea. (Fig. 83.) The bones of the skeleton are of dense texture and destitute of medullary cavities; they are not loaded with oil, as in the Cetacea. In the Indian dugong there are seven cervical vertebræ, nineteen costal vertebræ, and thirty lumbar, pelvic, and caudal. In the dugong of the Red Sea the lumbar, pelvic, and caudal vertebræ amount to thirty-three; making in all fifty-nine. The number of the ribs is nineteen on each side. The lower jaw is articulated to the cranium by a true synovial capsule, reflected over cartilaginous surfaces, and not, as in the true Cetacea, by a coarse oily ligamentous substance. In the lamantin, or manatee, the



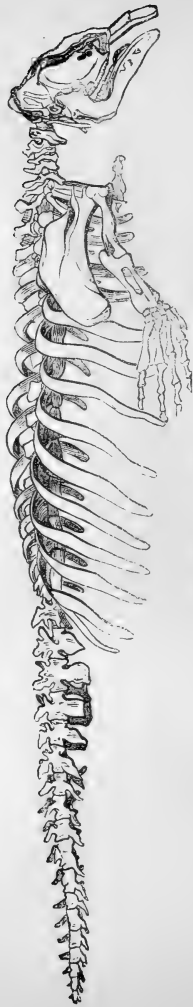
83.—Vascular Apparatus of Whale.

ribs are sixteen on each side. Fig. 84 represents the skeleton of the dugong, and Fig. 84* that of the manatee. They may be compared together, and with the skeleton of the porpoise, Fig. 94* (a true cetacean), with advantage.

Fig. 85 represents the skull of the dugong; Fig. 85*, that of the manatee. The skull of the manatee may be distinguished from that of the dugong by the following particulars:—The nasal bones are very small, and imbedded, so to speak, in the frontal, which consist of two



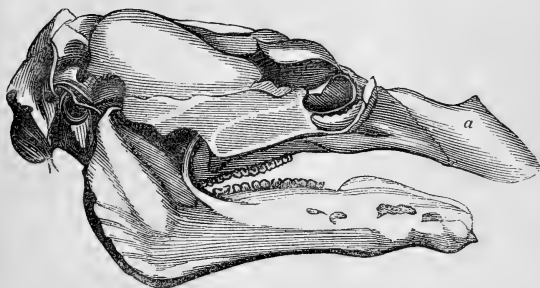
84.—Skeleton of Dugong.



84*.—Skeleton of Manatee.



85.—Skull of Dugong.



85*.—Skull of Manatee.

portions advancing forwards, so as to enter into the upper margin of the nasal orifice, and form the ceiling of the orbits. The intermaxillary bones (*a*) advance far forwards, but are destitute of teeth, excepting during the early stages of the animal's existence; these bones form the lateral edges of the nasal orifice, which is very spacious; but in the living animal the bones are con-

tinued by a cartilaginous addition, so that the nostrils open at the end of the muzzle. The orbits are situated far forwards, and their margin is very prominent; the zygomatic arch is broad and strong; the muzzle advances directly forwards with a very slight gradual downward bend. The dentition of the manatee (Fig. 86) is not

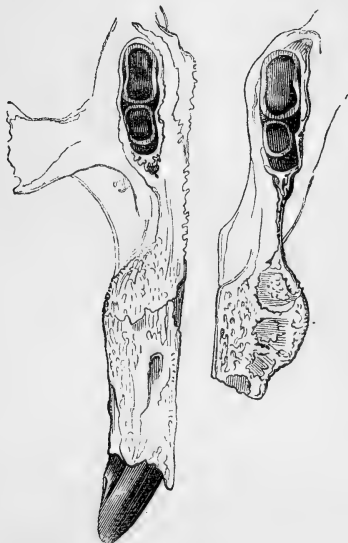


86.—Teeth of Manatee.

correctly ascertained. In adult skulls eight molars on each side are usually found, in others nine or ten; and Fred. Cuvier observes that, as in some of the ordinary *Pachydermata*, the anterior molars, worn the first, fall

as the posterior ones become developed, being, indeed, pushed out by their advance.

The skull of the dugong (Fig. 85) is distinguished by the enormous size of the intermaxillary bones, *a*, which extend backwards as far as the middle of the temporal fossæ, and are bent down with a sudden angle (re-



87.—Teeth of Dugong.

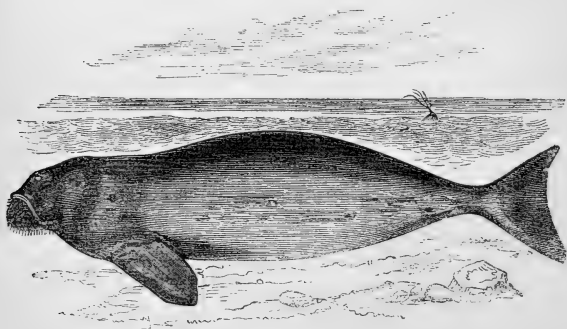
minding us of the beak of the flamingo) over the elongated symphysis of the lower jaw. In this deflected portion of each intermaxillary bone is lodged the root of a permanent, tusk-like, but not very prominent incisor, there being two of these teeth above, none below. This development and shape of the intermaxillary bones throws

the nasal orifice higher up than in the manatee: the lower jaw is thicker, shorter, deeper, and its symphysis fits the deflected portion of the intermaxillary bones. In the young dugong the molars are five on each side, above and below; but the three anterior are deciduous, the two last being permanent (see dentition, Fig. 87). To those who wish to investigate the anatomy of this animal we recommend a paper by Professor Owen, in the 'Zool. Proceeds.' for 1838, p. 28.

THE DUGONG

(*Halicore Dugong*, F. Cuv.; *Halicore Indicus*,
Desmarest).

This species is a native of the Indian seas, being common among the islands of the Indian Archipelago, and visiting also the coasts of New Holland. (Fig. 88.) Its favourite haunts are the mouths of rivers and straits between proximate islands, where the depth of water is but trifling (three or four fathoms), and where, at the bottom, grows a luxuriant pasturage of submarine algæ and fuci: here in calm weather may small troops be



88.—Dugong.

seen feeding below the surface, and every now and then rising to take breath. The position of the mouth, the muscular powers and mobility of the lips garnished with wiry bristles, and the short incisor tusks of the upper jaw, enable these animals to seize and drag up the long fronds of the subaquatic vegetables which constitute their nourishment.

The dugong (more properly duyong) is in high esteem as an article of food, its flesh being tender and not unlike beef; hence it is hunted assiduously by the Malays, who attack the animal with harpoons, in the management of which they are very dexterous.

The mutual affection of the male and female is very great, and the latter is devoted to her offspring. If a dugong be killed, the survivor of the pair, careless of danger, follows after the boat, carrying the body, impelled by an overmastering passion, and thus often shares the fate of its partner; indeed, if one be taken, the other is an easy prize.

The dugong attains to the length of seven or eight feet; its caudal paddle is crescent-shaped; the large thick upper lip hangs over the lower; the skin of the body is thinly set, with very short prickly bristles; the anterior limbs, or flippers, are destitute of nails. The ventricles of the heart are not united together, but form as it were two distinct hearts joined at the top: this separation of the ventricles does not alter the routine of the circulation. The eyes are very small.

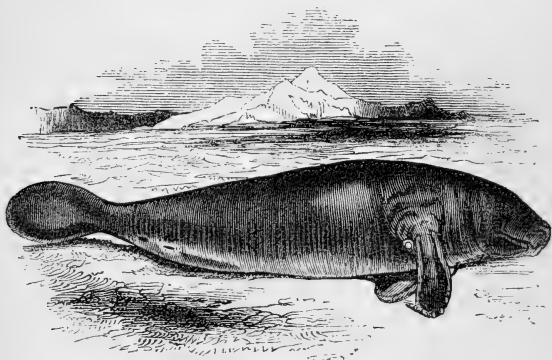
An allied species (*Halicore Tabernaculi*) has been discovered by MM. Ehrenberg and Rüppel in the Red Sea.

THE MANATEE, OR LAMANTIN

(*Manatus Americanus*; *Trichecus Manatus*, Linn.).

The American manatee inhabits the embouchure of the Amazon, Orinoko, and other rivers of South America, and feeds upon subaquatic herbage. Its flippers exhibit rudiments of nails, and by their aid it sometimes drags its unwieldy body on shore, and crawls up the banks,

either to bask in the sun or seek for terrestrial vegetables. (Fig. 89.) The males and females are mutually attached to each other, and the latter are tenderly devoted to their young, which soon after birth they carry under their flippers, where the teats are seated. This species measures from six to seven feet in length; the head is small, the muzzle thick and fleshy, presenting at its extremity a semicircular disc, at the upper part of which are the nostrils, semicircular orifices, directed forwards. The eyes are small; the aperture of the auditory canal almost imperceptible. From the shoulders the body gradually diminishes, and terminates in a flat, horizontal, oval paddle.



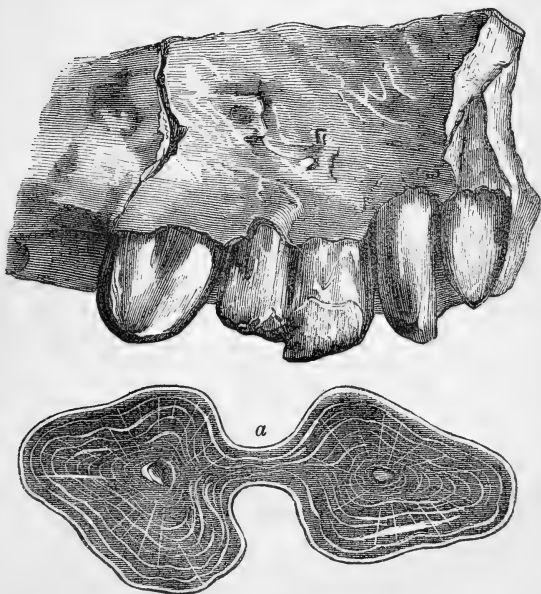
89.—Manatee.

A distinct species (*Manatus Senegalensis*, Desm.) is found in the embouchure of the Senegal and other rivers of Western Africa; its manners resemble those of the preceding, but we have no very precise details.

According to Dr. Harlan, a distinct species of manatee, which he terms *Manatus latirostris*, inhabits the shores of some parts of North America.

ZEUGLODON.

The fossil teeth here represented were discovered by Dr. Harlan in America, and attributed by him to an extinct reptile, which he termed *Basilosaurus*. Professor Owen, however, proves them to belong to an extinct animal referable to the present tribe, and allied to the manatee and dugong; and for this animal he has proposed the name of *Zeuglodon*, a word suggested by the form of the posterior molars, which resemble two teeth tied or yoked together. (Fig. 90.) *a* represents the



90.—Fossil Teeth of Zeuglodon.

cut surface of one of these teeth, each part exhibiting a central pulp-cavity, and concentric striæ of growth. For minute details see 'Mag. Nat. Hist.' May, 1839, p. 209.

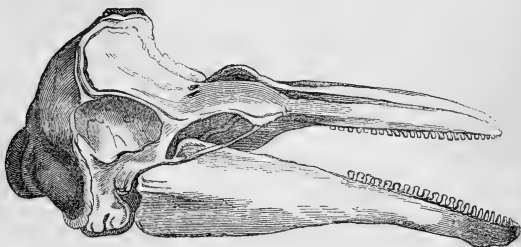


ORDER—CETACEA.

THE Cetacea are characterized by the conical fish-like form of the body, covered with a smooth naked skin, adapted for the medium in which they live; between the skin and the muscles is a layer of blubber, varying in thickness in different species, and most abundant in the Greenland whale, its thickness being from eight or ten to twenty inches. The uses of this layer are various: in the first place, it renders the huge body of these animals specifically lighter than the surrounding fluid; secondly, it materially tends to the preservation of the vital heat; and, thirdly, it affords protection to the internal organs against the effects of the enormous pressure to which these animals are subject while plunging deep into the abysses of the ocean. The fore limbs are modified into flippers, and the posterior part of the body, destitute of hind limbs, is continued conical, and terminates in a broad horizontal cartilaginous paddle. On the central line of the upper surface, and generally towards the tail, is sometimes seated a small vertical cartilaginous fin, unconnected with the skeleton. This fin varies in figure, and is often absent. It is partly by the aid of this fin, where present, but more so by that of the flippers, that the Cetacea balance themselves in the water, for when dead or dying they float on the side or the back. The mode of progression consists of a series of leaps or impulses produced by the action of the tail, which is bent down and then struck out with greater or less violence, according to the rapidity with which the animal is cleaving its way. By means of this organ it can dive instantaneously, or even leap out of the water, throwing the waves around into spray and foam. In the ordinary position of the Cetacea while floating, only the top of the head and part of the back appear above the surface,

their capacious jaws, and also the eyes, being beneath; hence, in order to admit of uninterrupted respiration, the situation and structure of the nostrils are modified accordingly.

These animals are called blowing Cetacea, because, in consequence of the structure of the nostrils, they are capable of throwing up jets of water or spray accompanied with a loud noise; this act is termed blowing, and the nasal orifices blow-holes or spiracles; they open on the top of the head, and lead to two large membranous pouches seated immediately below the integument. These pouches are receptacles for fluid, which, being forced up into them, is prevented from returning into the throat by certain valves furnished with strong muscles, lodged above the intermaxillary bones (see Fig. 91,



91.—Skull of Dolphin.

the skull of the Dolphin); it is in the hollow at the top of the head that these pouches are placed. The posterior nasal passage is furnished with longitudinal and circular muscular fibres, and opens into the pharynx, or back part of the mouth; and into it the larynx rises in the form of a pyramid, and the circular fibres of the nasal passage have the power of grasping it by their contractions. The channel, therefore, from the larynx thorough the posterior nasal passage into the pouches is plain. Now these pouches are lodged, as we have said, beneath

the skin, and the nostrils which conduct to them open externally by a transverse semilunar slit, while very strong muscular fibres, radiating from the entire circumference of the cranium, cover the whole surface of the apparatus, and act as compressors of the pouches. Let us suppose, says Cuvier, "that the cetaceous animal has taken into its mouth some water which it wishes to eject; it moves its tongue and jaws as if it were about to swallow, but, closing the pharynx, it forces the water to mount into the nasal passage, where its progress is ac-



92.—Section of Head of Porpoise.

celerated by the action of the circular fibres, until it raises the valves and distends the membranous pouches above. Here it can be retained until the animal wishes to eject it and take in breath. In order to spout, the valves being closed, it forcibly compresses the pouches by means of the muscular expansions which cover them; and, compelled to escape by the narrow crescentic aperture, it is projected to a height corresponding to the force of the

pressure." The noise, however, called blowing, shows that the animal forcibly exhausts its lungs of the pent-up breath, driving the air through the nasal orifices, which, mingled with the water contained in the pouches, rises like spray or dense midst. Fig. 92 represents a section of the head of the porpoise, showing the structure of the nasal apparatus. This apparatus is of little use as an olfactory organ, the sense of smell being very deficient. As respects the organs of sight, we may observe that the eye is very small, and adapted, as in fishes, to the density of the surrounding medium, the cornea being flat, and the crystalline lens globular; there is no lachrymal gland, but the lids are furnished with certain little glands secreting a fluid adapted for lubricating the eyeball. The external aperture of the ear is minute and capable of being closed at pleasure. Under water the whale hears the smallest sounds, the slightest splash of the oar, but to sounds in the air above, even the report of a cannon, as Scoresby states, it is insensible. Its auditory apparatus, enclosed in a bone (petrous portion of the temple) remarkable for hardness, appreciates only the vibration of water. The sense of taste does not appear to be acute.

The Cetacea, passing their existence in the wild waste of seas, are capable of remaining submerged for a considerable length of time, and the vascular system is modified accordingly, the arteries not only of the limbs, but of the chest and vertebral canal, being singularly plexiform. The discovery of this arrangement is due to the celebrated W. Hunter, who published an account of it in the *Phil. Trans.* 1787. These animals, he says, "have a greater proportion of blood than any other known, and there are many arteries apparently intended as reservoirs where a larger quantity seemed to be required in a part, and vascularity could not be the only object. Thus we find that the intercostal arteries divide into a vast number of branches, which run in a serpentine course beneath the pleura (lining membrane of the chest), the ribs, and their muscles," forming a deep maze of intermingled and contorted tubes. "These vessels, everywhere lining

the sides of the thorax, pass in between the ribs near their articulation, and also behind the ligamentous attachment of the ribs, and anastomose with each other. The spinal cord is surrounded with a network of arteries in the same manner, more especially where it comes out from the brain, and where a thick substance is formed by their ramifications and convolutions. Fig. 83 represents the arrangement of the arteries of the chest.

Nor is this plexiform arrangement peculiar to the arterial system; it is even more strongly displayed in the venous; the veins in certain parts forming immense plexiform reservoirs. This curious disposition of the vascular system in the Cetacea is, as we have intimated, most probably connected with their habits of diving, during which their respiration is suspended, and consequently the passage of the blood through the lungs impeded; while at the same time they are subjected to a great pressure. Hence perhaps the arterial plexuses are needed as reservoirs stored with oxygenated blood for the use of the system, while the venous plexuses are reservoirs for the sake of safety during the suspension of respiration.

The females of this order have two teats deeply imbedded at the lower portion of the abdomen. The stomach is very complicated, divided into several compartments, and digestion is very rapid.

As these animals have to plough the waves head foremost, a long or even decided neck would interfere with their movements, consequently the cervical vertebræ are compressed into a small space, and more or less entirely anchylosed into one mass, to the total immobility of the head, the axis of which cannot be altered without a corresponding alteration of that of the body. It is moreover remarkable that the two halves of the head do not precisely correspond in symmetry. This is especially observable in the dolphins, porpoises, grampus, and cachalot. (See Mechel's '*Anatomie Comparée*,' vol. iv. p. 361.)

The Cetacea are all carnivorous, but their prey differs from the small mollusk to fishes and even the smaller of

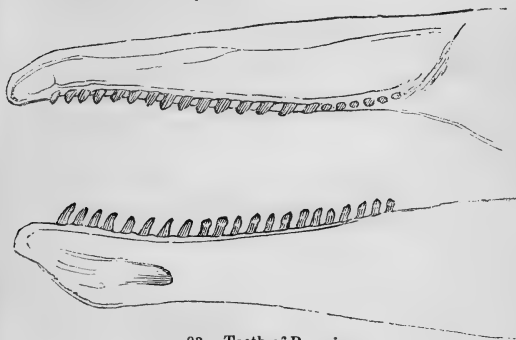
their own order; and their teeth are modified accordingly. They are divided into the following families:—

1. *Delphinidæ*, Dolphins, Grampuses, Narwhals, &c.
2. *Catodontidæ*, Cachalots, or Spermaceti Whales.
3. *Balenidæ*, Rorquals and Blubber Whales.

FAMILY—DELPHINIDÆ (Dolphins, Porpoises, &c.).

THE COMMON PORPOISE (*Phocæna communis*).

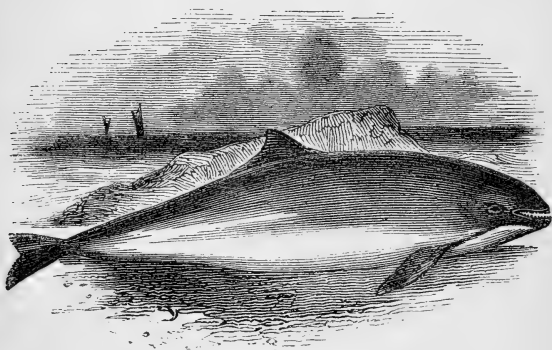
In the genus *Phocæna* the snout in the living animal is not produced as in the dolphin; but in other respects the characters are the same. The teeth are numerous, compressed, rounded, and interlock when the jaws are closed, and are well fitted for snapping at and retaining the slippery prey. (Fig. 93.) A dorsal fin is present. There are several species.



93.—Teeth of Porpoise.

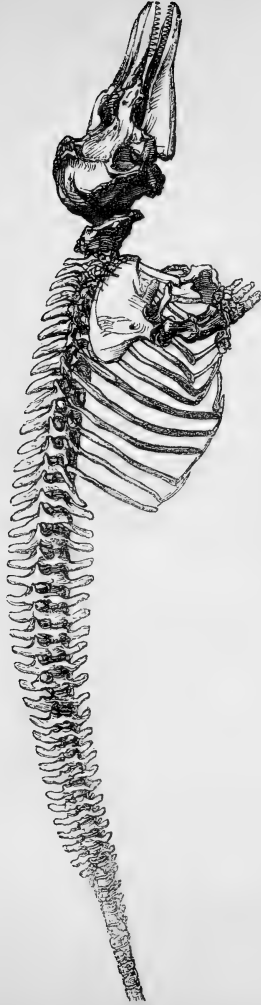
The common porpoise is active, fleet, and voracious; it frequents, in troops, the bays and inlets of our coast, and especially the mouths of rivers, not unfrequently advancing to a considerable distance up their stream. (Fig. 94.) In such places it is often taken in nets by the fishermen, becoming entrapped while eagerly pursu-

ing its prey. When the shoals of herring and other fish which periodically visit our coast make their appearance, they are harassed, among other enemies, by this active and voracious animal, which revels in the luxury of a perpetual feast; and as its appetite is enormous and its digestion rapid, the slaughter in which it appears incessantly occupied must be very great. The porpoise is common at the Nore, and few have sailed to Margate or Ramsgate who have not seen these animals tumbling along, as they appear to do, in the rushing waves. The peculiarity of their motion results from the horizontal



94.—Common Porpoise.

position of the tail-paddle, and the up-and-down stroke which it gives; and their momentary appearance is for the purpose of breathing, which accomplished, they plunge down in search of their food. In former days the flesh of the porpoise was highly esteemed as a delicacy for the table, and was served at public feasts; indeed, it is but lately that it has fallen into disrepute, and been omitted at City entertainments, where the turtle usurps its place. Our forefathers must have had a different notion about



94*.--Skeleton of Porpoise.

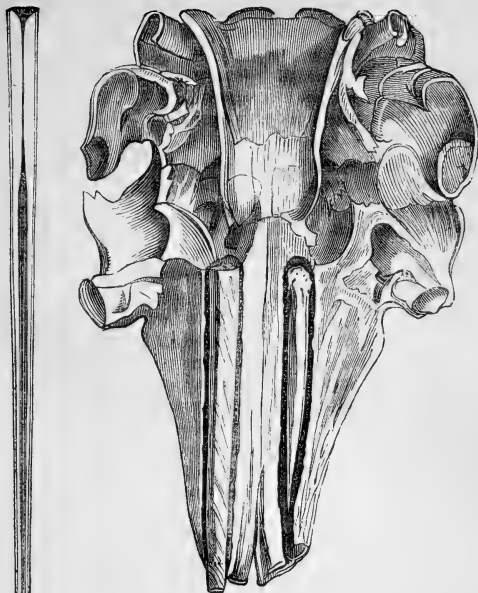
table delicacies from ourselves; for few, we believe, would now relish the rank, oily, fishy flesh of this animal. Length about five feet. Fig. 94* represents the skeleton.

Fig. 91 represents the skull of the dolphin (*Delphinus Delphis*), a species celebrated by the ancients, and resembling the porpoise in its habits and food. The aquatic evolutions of these animals, as seen sporting around ships, apparently for the sake of amusement, their varied and rapid turns, and gambols, are well described by Ovid—

“Undique dant saltus, multâque adspergine rorant;
Emerguntque iterùm, redeuntque sub æquora rursus,
Inque chori ludunt speciem, lascivaque jactact
Corpora, et acceptum patulis mare naribus efflant.”

THE NARWHAL (*Monodon monoceros*).

The genus *Monodon*, of which the narwhal is the only recognised species, is provisionally placed by Cuvier in the family Delphinidæ. It evidently forms the type of a distinct group. Among the Cetacea inhabiting the dreary realms of the Polar Ocean, the narwhal, if not the largest or among the largest, is nevertheless one of the most remarkable: its general form resembles that of the porpoises; it has, however, no teeth, properly so called, but two ivory tusks, or spears, implanted in the intermaxillary bone, but of which the right remains usually rudimentary and concealed during life. The left tusk, on the contrary, attains to the length of from five to seven or eight and sometimes ten feet in length, and projects from the snout in a right line with the body, tapering gradually to a point, with a spiral twist (ropelike) throughout its whole extent (Fig. 95, where, by an oversight, the tusks have been transposed). In its structure and growth this tusk resembles that of the elephant, being hollow at its base or root, and solid at its extremity. It is in the male only that this spear-like weapon, under ordinary circumstances, becomes duly developed, the females (and indeed the young males) having the left as



95.—Skull and Tooth of Narwhal.

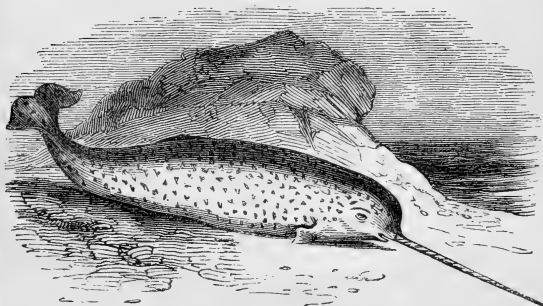
well as the right tusk concealed within its bony socket. This rule, however, is not invariable, for females have not only been seen with the left tusk projecting, but the right also, if we may credit the account of Lacépède, who states that Captain Dirck Peterson, commander of a vessel called the *Golden Lion*, brought to Hamburg, in 1689, the skull of a female narwhal, having two tusks implanted in it, of which the left measured seven feet five inches, the right seven feet. It may be added that Captain Scoresby brought

home the skull of a female narwhal in which both tusks projected, though only to the distance of two and a quarter inches, and which was examined by Sir E. Home. Nor with respect to the male must it be supposed that the right tusk never becomes developed, for, on the contrary, instances sometimes occur in which the right tusk projects externally nearly as far as the left; and there are grounds for supposing that, when the left becomes lost, or broken by accident, the right tusk becomes developed to supply the deficiency. Formerly these horns, or tusks, were looked upon to be the horns of the fabulous land-unicorn, and therefore they were valued as an inestimable curiosity, and sold excessively dear, till the Greenland fishery was set on foot, when they became more common, and their real nature known.

The use assigned to the tusk of the narwhal by Crantz, viz. that of uprooting marine vegetables on which to feed, is altogether a supposition. As the male only has this instrument developed, or generally the male, the female must be reduced to sad difficulties in the procuring of food; but in truth the position of the tusk renders such a use as is here attributed to it impossible. Moreover the narwhal does not subsist on marine fuci, or algæ, but on soft animal matters, as mollusks and fish. Captain Scoresby found the remains of cuttle-fish in the stomachs of several which were opened by him, and similar remains were also found in the stomach of one driven ashore near Boston.

In general form the narwhal resembles the porpoise, but the head is small and blunt; the mouth is small, and not capable of much extension. The under-lip is wedge-shaped. The eyes are placed in a line with the opening of the mouth, at the distance of thirteen or fourteen inches from the snout, and of small size, being about an inch in diameter. The spiracle, or blow-hole, is a single orifice of a semicircular form, on the top of the head, directly over the eyes. The fins, or flippers, are about fourteen or fifteen inches long, and from six to eight broad: their situation on the sides of the animal being at one-fifth of its length from the snout. The breadth

of the tail is from fifteen to twenty inches. There is no dorsal fin, but a sharp ridge runs down the centre of the back, the edge of which is generally found to be rough, and worn, as if by rubbing against the ice. At an early age the narwhal is blackish gray on the back, with numerous darker spots and markings running into each other, forming a general dusky black surface. The sides are almost white, with dusky and more open markings; the under surface is white. In adult specimens the ground-colour of the back is yellowish-white, with markings varying from dark gray to dusky black, and of a roundish or oval figure, with interspaces of white or yellowish-white between them. The skin resembles that of the common Greenland whale (*Balæna mysticetus*), but is thinner. (Fig. 96.) The female narwhal produces a single young one at a birth, which she nourishes with milk for several months.



96.—The Narwhal.

To the rapidity, the great powers, and the ferocity of the narwhal when attacked, many writers have borne testimony. Its form is admirably adapted for cleaving the waters, and we can well believe that the shock of its weapon, driven full tilt against an enemy, must produce a terrible effect. The ribs of the stoutest boat would

be transfixed by the dint of such a blow, far more easily than was ever shield by the lance of knight in battle or tournament. Several instances have indeed been known in which the animal has plunged his weapon deep into the thick oak timbers of a ship, when it has fortunately snapped short, the fragment remaining fixed in the orifice, so as to plug it up. A portion of wood taken from the hull of a ship with a piece of narwhal's tusk firmly imbedded in it came some few years ago under our own inspection. It is probably only in defence of the females and their young, unless indeed when attacked himself, that the male narwhal thus rushes against ships or boats; for we utterly discredit the usual accounts of its causeless and indiscriminate attacks upon any object which approaches within its range. Doubtless when wounded and harassed it becomes desperate; and its power, its velocity, and weapon combine to render it formidable.

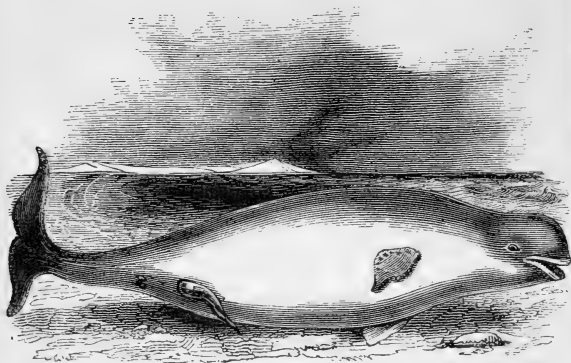
The narwhal is gregarious, associating in troops of from six or eight to twenty or more; and numbers are often seen clustered together, both in the open sea, and in bays and inlets free from the ice, forming a compact phalanx, moving gently and slowly along. Under such circumstances the independent movements of each individual are necessarily embarrassed, so that a considerable slaughter may be easily effected among them. When attacked at such a time, the hind ranks, instead of turning against their assailants, press upon those before, sliding their long weapons over the glossy backs of their leaders, and all becomes disorder and confusion. Opportunities of this kind are welcome to the Greenlanders, to whom the narwhal is an important animal. Independently of the oil, which the narwhal yields in considerable quantity and of excellent quality, the flesh is much esteemed by these people as food, and eaten both fresh and in a dried and smoked state, being prepared over the fire of their huts. The tendons of the muscles are useful in the preparation of thin but tough cordage; and Duhamel states (see his '*Traité des Pêches*') that several membranous sacs are obtained from the gullet, made use of as parts

of their fishing apparatus. The ivory spear, or tusk, the Greenlanders employ in various household and economical purposes instead of wood, and in the manufacture of weapons, as darts or arrows, &c. When struck by a harpoon, the narwhal dives with great velocity, and in the same manner as the whale, but not to the same extent. In general it descends about 200 fathoms; and on returning to the surface is despatched by a whale-lance without any difficulty. The blubber is about three inches in thickness, and invests the whole body: it affords about half a ton of oil.

The narwhal may be registered among the occasional visitants to the British shores. Of its visits, however, only three instances are on record, as far as we can learn. The first is recorded by Nicolas Tulpius in 1648. The second is of one killed, in 1800, near Boston, in Lincolnshire, and said to have been twenty-five feet in length. The third instance occurred in 1806, at the Sound of Weesdale, in Shetland.

THE BELUGA (*Delphinapterus Leucas*, Pall.).

The genus *Delphinapterus* is characterized by the presence of a dorsal fin. Head small and blunt; teeth variable in number. The beluga (White Fish, or White Whale) is a native of the high northern latitudes, and is one of the most beautiful, confident, and active of its race. Its colour is clear milk-white, sometimes tinged with a rose-colour or a slight wash of yellow, and the skin is very soft, smooth, and slippery. It associates in small troops or families, and is in the habit of following and surrounding boats or ships, gambolling like the dolphin around them; or chasing its finny prey, in quest of which it often ascends the mouths of rivers, occasionally to a considerable distance. (Fig. 97.) During the intense severity of the winter, the beluga is said to migrate southwards; this journey cannot, however, be to any great extent, as it very rarely occurs in the sea around the most northern portion of the British Isles. Indeed we do not know of more than one instance on record of



97.—Beluga.

his species visiting our coasts; we refer to the individual taken, in the summer of 1815, in the Frith of Forth, where it had been observed for nearly three months ascending with the flood-tide and regularly descending with the ebb. This individual, as is proved by the time of the year in which it was seen, was a stray wanderer from its native latitudes, and not on a regular journey of migration. The flesh of this animal is eaten by the Greenlanders and other people of the boreal regions. Crantz says it is as red as beef, and of somewhat similar flavour; Pallas, that it is black. The carcase yields excellent oil, and it is principally for the sake of this that the beluga is hunted. It is sometimes intercepted by nets extended across the inlet or stream it has entered, and attacked with lances while endeavouring to force its return: on other occasions it is harpooned, and sometimes even caught by means of hooks baited with fish. The female produces one or two young at a birth, towards which she displays the strongest attachment; they follow her in all her movements, and do not quit her until they are of considerable size. Cuvier states that the teeth

are nine in number on each side, above and below. Mr. Bell states that, in a cranium in his possession, there are eight teeth in the upper and six in the lower jaw, on each side; but that, as two have evidently fallen from the former, there must have been ten originally. Aged individuals are often found without any teeth in the upper jaw. The beluga measures, when adult, seventeen or eighteen feet in length. That caught in the Frith of Forth measured thirteen feet four inches, and nearly nine feet in circumference at the thickest part, viz. the centre of the body, whence it tapers both to the head and to the tail.

FAMILY—CATODONTIDÆ (*Physeteridæ*, Bell).

THIS family, which includes the Cachalots, is characterized by the immoderate size of the head, which equals one-third the length of the body, and terminates in a deep, abrupt, truncate snout, advancing beyond the lower jaw, which is narrow, the two rami being in contact for the greater part of their length, and armed each with a row of compressed, solid, conical teeth, at equal distances fitting into cavities in the upper jaw, which is either destitute of teeth, or merely furnished with a few in a rudimentary state and almost covered by the gum. The blow-holes open externally by a single orifice. The tongue is small and pointed.

THE COMMON CACHALOT, OR SPERMACETI WHALE

(*Physeter macrocephalus*, Linn.; *Physeter Catodon*, Linn.; *Catodon trumpo*, Lacépède; Blunt-headed Cachalot, Pennant).

The cachalot is one of the mightiest of the Cetacea, the adult male measuring upwards of seventy feet in length; and from its powers, and not unfrequent paroxysms of fury, is one of the most dangerous of the monsters of the deep which the daring sailor is called upon to combat. (Fig. 98.)

The cachalot roams the ocean at pleasure, and is seen

in all latitudes, but its native regions may be considered as the arctic and antarctic seas.* It would seem that the animal is gregarious; and is generally seen in parties consisting of half-grown males, or of females attended by their young, and guarded by one or two males of the largest size. When solitary cachalots are observed, they invariably prove to be aged males.



98.—Spermaceti Whale.

According to Mr. F. De Bell Bennett ('Zool. Proceeds.,' 1837, p. 39), the speed of an alarmed cachalot does not exceed from eight to ten miles an hour, though when harpooned its temporary velocity may be estimated from twelve to fifteen miles. When thus flying from pursuit, the huge animal moves with a regular and majestic, although rapid pace, and with a gently leaping gait: the anterior and upper portions of the colossal head are raised above the water, and a portion of the back is also frequently exhibited. When parties are pursued, they often move in lines like a troop of horse, and exert all their movements, and descend, rise, and even spout in unison. When about to plunge deep, the cachalot assumes a vertical position, raising the caudal fin, or "flukes," perpendicularly in the air, an action that is

* Baron Cuvier considers that only one species of spermaceti whale, or cachalot, exists. And Fred. Cuvier adopts this opinion, with some doubt as to whether the southern cachalot may not be distinct, which Mr. Bell regards as being the fact. As the elucidation of doubtful species is not our present object, we leave the question open, and speak of the cachalot in general terms as a native of the Northern and Southern oceans.

performed leisurely, and one that distinguishes this from most other species of Cetacea. This evolution is not, however, invariably performed, since, when tranquilly feeding, or carelessly avoiding a boat, the cachalot will descend very gradually, lowering itself, or, as it is technically termed, "settling down."

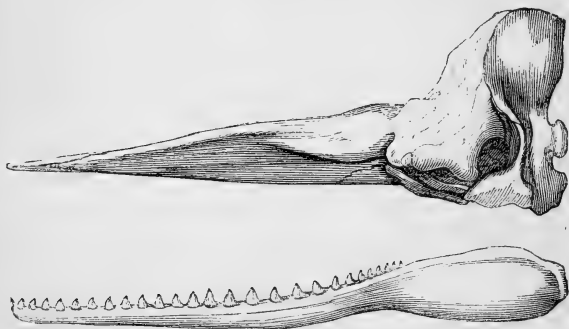
The ordinary length of time which the cachalot remains under water, when alarmed or wounded, is three-quarters of an hour, but in some instances the time has extended, it is said, to an hour and a quarter.

The chase of this animal is very hazardous, for although generally the troop fly on the appearance of danger, yet, when one is wounded, the others often come to the rescue, especially in the case of the females, which assist each other; while the males, as Mr. Bennett affirms, commonly make a speedy retreat. One of the latter, however, if attacked and infuriated, is extremely formidable, and will rush with immense velocity, head foremost, against a boat, shivering it to pieces, or, lashing with its tail, will cut it asunder, scattering the hapless mariners, some, perhaps, struck dead, others maimed, on the surface of the rolling ocean. Occurrences of this kind are indeed numerous, and many a thrilling narrative of the "hair-breadth 'scapes," and of loss of men and boats, in the close encounter with this giant of the waters, can an old South Sea whaler tell, and many have been recorded, which of themselves would fill a goodly and not uninteresting volume. Not only are the boats in jeopardy, but the "whaling vessel" itself is not secure:—Mr. Bell refers to an authenticated instance of an American ship of large size being stove in and foundered by a blow from a gigantic male cachalot rushing head foremost against it.

The food of the cachalot consists of seals, and fishes of a large size, which it pursues with great pertinacity; but it would appear that a large species of cuttle-fish (*Octopus*) forms its principal nutriment.

We have already noticed the magnitude of the head of the present species, and we may here observe that this magnitude is not owing to any extraordinary develop-

ment of the skull: the maxillary and intermaxillary bones are indeed prolonged, but the cranial portion is small, and rises abruptly (see Fig. 99, Skull of the Cachalot in profile). If, however, we look at the upper surface of the skull (Fig. 100), we find the top deeply concave, with a margin continued along the outer edge of each maxillary bone. It is in this concavity principally that the substance termed spermaceti, or more properly cetine, is lodged, and that in such immense quantity as to give to the head its extraordinary size and figure. This substance, in a semi-fluid state, is contained in a



99.—Skull of Spermaceti Whale, in profile.



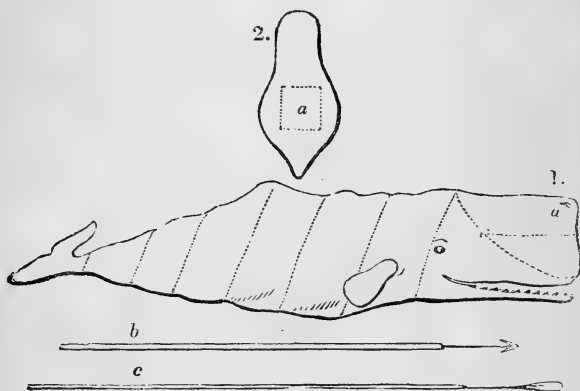
100.—Skull of Spermaceti Whale, seen from above.

tissue of cells, not only filling up the concavity of the surface of the skull, but giving to the head a singular elevation, the whole being invested by a dense cartilaginous expansion. Cetine is also found in cells along the back and in other parts of the body. This cetine exists mixed with oil, and, when the whale is killed, a hole is made in the outer and upper part of the head, and the oleaginous fluid is baled out with buckets. The first process is the separation of the oil by means of draining and squeezing; the impure cetine is then put into barrels in the state of a yellow unctuous mass, and is afterwards further purified by the following process:—"The mass is put into hair or woollen bags, and pressed, between plates of iron in a screw-press, until it becomes hard and brittle; it is then broken into small pieces and thrown into boiling water, where it melts, and the impurities are separated from it. After being cooled and taken from the first water, it is put into a boiler of clean water, and a weak solution of potash is gradually added. This is thrice repeated, after which the whole is poured into coolers, when the spermaceti concretes into a white semi-crystallized mass, and on being cut into small pieces exhibits a beautiful flaky appearance, so well known as belonging to the spermaceti of commerce." An ordinary-sized whale will yield twelve large barrels of crude spermaceti.

Like other whales, the cachalot is clothed with a layer of blubber, but in less abundance than in the common whale (*Balæna mysticetus*). The oil procured from it, however, is thinner and more valuable. Fig. 101 represents in outline, 1, the spermaceti whale, with the sections marked for flensing; 2, the anterior aspect of the head; *a*, the place where the hole is made; *b*, the harpoon; *c*, the lance.

There is another substance produced by the cachalot, known in commerce under the name of ambergris. This substance, in the form of opaque grayish masses, marbled with darker tints, and somewhat hard and brittle, is found floating in many parts of the sea, or thrown up on the shore. It is most abundant in the neighbourhood of the Moluccas and along the coasts of China, Japan, Mada-

gascar, Africa, and also South America. Its consistence resembles that of common wax; it is fatty, inflammable, and when heated emits a fragrant but powerful musky odour. In general it is mixed up with the beaks of cuttlefish, the bones of fishes, and other foreign matters. For a long time the nature of this substance was utterly unknown. It has been regarded by some as a sort of bitumen, or as a kind of gum, and by others as a composition of wax and honey. It is now known to be produced, as a concretion, in the intestines of the cachalot, and is



101.—Spermaceti Whale.

often found in sickly or diseased animals; indeed, Dr. Schwediawer asserts that the existence of these indigestible concretions often occasions abdominal abscesses, after the bursting of which the ambergris is found floating on the surface of the sea. Formerly this substance was in high estimation as a medicine; at present it is only used as a perfume, but is seldom to be obtained unadulterated. As in most of the Cetacea, the skull of the cachalot is destitute of symmetry, having a turn as it

were, or bend, towards the left; it is asserted also that the left eye is smaller and more limited in visual range than the right, on which account the sailors endeavour to attack it on its left. Mr. Bennett makes no allusion to this circumstance, but merely observes that, if boats are not brought within the line of vision, the animal may be approached with great facility, the sense of hearing being very imperfect; "a deficiency, however, which appears to be in some measure compensated for by the perfection in which it possesses the sense of touch, through the medium of a smooth skin abundantly supplied with nervous papillæ. It even appears as though the cachalots had the means of conveying impressions to one another through the water, at considerable distances; for it is a fact well known to the southern whalers, that, upon a cachalot being struck from a boat, others that are miles distant will almost instantaneously display by their actions an apparent consciousness of what has occurred, and either take themselves off or come down to the aid of their injured companion." This intelligence he supposes can only be communicated by a concussion of the water.

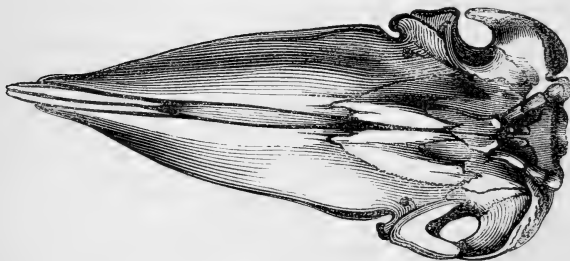
We have said that the cachalot roams all seas; it appears, however, to be more scarce in the arctic latitudes than formerly, but is abundant in the Southern Ocean, and within the regions of the antarctic circle. According to Colnett, the neighbourhood of the Galapagos constitutes a sort of rendezvous in spring for all the cachalots frequenting the coasts of Mexico, Peru, and the Gulf of Panama.

We have several instances on record of this animal having been captured on our own coast, and on that of the adjacent continent; it has been seen in the Mediterranean, off the Southern shores of Europe, as well as off the shores of Southern Africa, and in the channel of Mozambique.

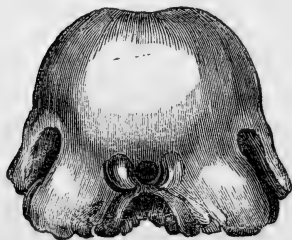
In 1769 a cachalot was killed in the Frith of Forth, and one was seen off the Kentish coast. In 1774 a large one was stranded on the coast of Norfolk; some few years since a small one was captured in the Thames near Gravesend. In 1784 thirty-two cachalots ran aground



102 —Lower Jaw of Spermaceti Whale.



103.—Skull of Spermaceti Whale, seen from below.



104.—Skull of Spermaceti Whale, back view.

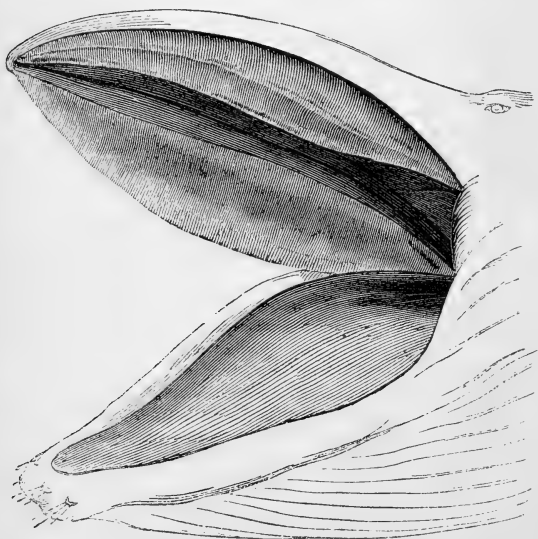
on the coast of Audierne, being stranded on the sands towards Cape Estain. In 1819 one of 63 feet in length was killed in Whitstable Bay. According to Lowe, the cachalot "is often driven ashore about the Orkneys, nay, sometimes caught."

The general colour of this species is grayish black above, lighter beneath; the eye is small, with a few stiff hairs around. There is no dorsal fin, but a distinct protuberance; the pectoral fins are small, and slightly grooved longitudinally. Fig. 102 represents a portion of the lower jaw, to show the teeth. Fig. 103, the skull seen from below. Fig. 104, the back view of the skull, showing its occipital elevation above the articulating processes and foramen magnum (see also Fig 99).

FAMILY—BALÆNIDÆ (THE TRUE WHALES).

THESE animals equal the cachalot in size, but have the head more proportionate to the bulk of the body, and display a less clumsy contour. They are, moreover, distinguished from all other Cetacea by the total absence of teeth; their place in the upper jaw, which is extremely narrow, being supplied by pendent horny laminæ, called whalebone, or baleen. - The palate of the whale is arched and oval (see Fig. 105), and forms a vaulted roof to which the plates of baleen are attached transversely, in two rows, parallel to each other. Each plate consists of a central coarse fibrous layer, lying between two which are compact and externally polished, constituting a sort of enamel or varnish; but which outer layers do not cover the internal or true baleen to its extreme free edge: the latter, therefore, extends beyond the former, and terminates in a fringe, in which are entangled the small mollusious animals which constitute the food of this huge animal. Each plate of baleen is of a subtriangular figure, and its base, attached to the palate, has a long furrow, fixed upon a pulp, buried deeply in the firm vascular substance of the gum covering the under surface of the maxillary and intermaxillary bones. The outer layers, of compact matter, are continuous with a white

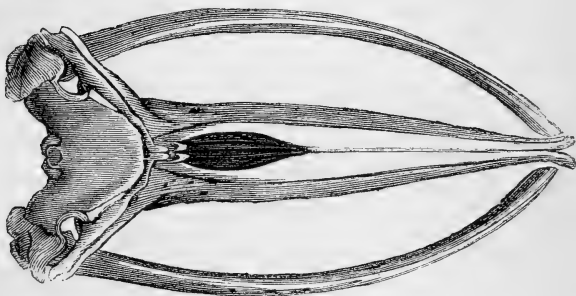
horny layer of the gum, which passes on to the surface of each plate, and the pulp is therefore the secreting organ of the internal layer of coarse elastic fibres. The number of plates composing each row is from 300 to 400, and, the palate being oval, the longest are those situated in medio; those towards the muzzle and near the entrance of the throat being consequently the shortest. The longest of these laminæ often measure 15 feet and upwards in length; and the abbreviation anteriorly and posteriorly is gradual. Each plate, as we have said, is fringed, and the filaments of the fringe are very numerous, and fill up the cavity of the mouth sufficiently to form a strainer. The lower jaw is arched boldly outwards on each side, so as to form



105.—Inside Jaws of Greenland Whale.



106.—Skull of Greenland Whale, in profile.



107.—Skull of Greenland Whale, upper view.



108.—Skull of Greenland Whale, under view ; lower jaw removed.

a broad ellipse, the margin of a huge spoon which ladles in and conveys to the strainer or fringes vast quantities of water replete with shoals of small crustacea, of the *clio borealis*, and other small tenants of the briny deep, which absolutely crowd its waters. The tongue is very large, thick, fleshy, fat, soft, and spongy. In the Greenland whale it often exceeds 20 feet in length, and nine or ten in width. The orifice of the gullet is very small; so that fish even of a moderate size cannot pass down. The eyes are small, and seated just above the angle of the enormous mouth. There are two distinct blow-holes on the top of the head. The skin is smooth and glossy. The blubber is abundant. In the Greenland whale the layer of this subcutaneous *lard* varies from eight or ten to 20 inches in depth, and a single whale of large size will yield about 40 tons;* but much more has occasionally been obtained. The lips appear to be composed of little more than cellular tissue and blubber.

Referring to our pictorial specimens of osteology, Fig. 106 shows the skull of the Greenland whale in profile; Fig. 107, an upper view of the same; Fig 108, an under view of the same, with the lower jaw removed; Fig. 108* represents the skeleton of the Greenland whale, in which the rudiments of the pelvis are apparent.

THE GREENLAND WHALE, OR GREAT MYSTICETE

(*Balæna Mysticetus*).

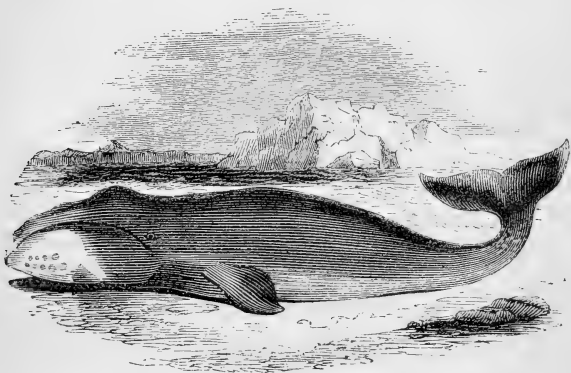
This colossal animal, yielding oil and whalebone, both valuable in a commercial point of view, is a native of the arctic seas, whither it is followed by a daring race of mariners amidst horrid icebergs and extensive floes, where danger in every form is imminent. Cold, intense beyond description,—this has to be borne; hunger, for often are the vessels ice-bound, and the provisions scanty,—this has to be endured; watchfulness, fatigue, and the chance of being engulfed during the tremendous conflict,

* The proportion of pure oil to the blubber is as three to four.



108*.—Skeleton of Greenland Whale.

—these the sailor bears and braves, content if he return home with a rich harvest gleaned from the arctic waters. The Greenland whale, therefore, even in this sense, is one of the most interesting of the Cetacea; nor is it less so from its habits and manners, which various observers, and in particular Captain Scoresby, have contributed to illustrate. The ordinary length of this species is from sixty to seventy or eighty feet; but it is said to attain occasionally to greater dimensions. Seen at a distance, it appears as a dark ill-defined mass floating on the surface of the water, and indeed it is only when lying on its side, after death, that its true outline is to be made out. (Fig. 109.)



109.—Greenland Whale.

It is upon minute animals, such as small shrimp-like crustacea, the *clio borealis*, medusæ, &c., that this huge animal supports his colossal frame. Ploughing his way beneath the surface with open mouth, he engulfs his prey by myriads, which become entangled among the filaments fringing the baleen, and thus are as it were sifted from the water, which escapes at the sides. Every

few minutes he rises to breathe, expelling through the blow-holes a column of steam and water, and again plunges to continue his repast. In order to dive, the whale first raises his head, and then plunges it under the surface, drawing his tail at the same time underneath the body so as to form the segment of a circle; instantaneously he strikes it out, and goes down like a shot. The length of time passed beneath the surface varies, but according to Captain Scoresby it seldom exceeds half an hour, and this only when harpooned; under such circumstances, on appearing again, which is generally at a considerable distance from the spot where the animal descended, he is always in a state of great exhaustion, owing chiefly to the immense pressure he has sustained, but no doubt in part to the long suspension of respiration: under ordinary circumstances the whale rises to breathe every eight or ten minutes.

The velocity of the whale is very great. Captain Scoresby harpooned one which, on being struck, descended four hundred fathoms, at the rate of eight miles an hour. But under the pain of this weapon they often descend a much greater depth, subjecting themselves to an enormous pressure of water, and are at the same time so overcome by terror as often to bruise themselves severely by the rocks met with in their course, and sometimes even to strike so violently against the hard bed of the ocean as to fracture their jaws. At the depth of 800 fathoms Captain Scoresby calculates the pressure at 211,200 tons.

The most pleasing as well as astonishing exhibition of the power and activity of these animals is during the pairing season, when they gambol and frolic in the waters, throwing themselves about in the exuberance of delight, little aware of the approach of their enemies. Sometimes they dart along the surface, and then dive and re-ascend with such energy as to leap entirely out of the water; sometimes they raise themselves perpendicularly; sometimes, head downwards, they flourish their tails aloft, and lash the water with tremendous violence, throwing the sea around them into foam, and

producing a roaring noise resounding to a considerable distance. The tail is, in fact, not only their organ of locomotion, but their weapon of defence, and, though extremely timid and peaceful, they often use it, when driven to despair, with terrible effect; and this the more particularly when one of a pair is struck, or the life of the cub is in danger. The mutual attachment of each pair, and the affection of the female for her young one, are intense; and many are the instances on record in which the one has died in defending the other. Captain Anderson relates that, "having struck one of two whales, a male and female, that were in company together, the wounded one made a long and terrible resistance; it struck down a boat with five men in it by a single blow of the tail, and all went to the bottom; the other still attended its companion, and lent it every assistance, until at last the whale that had been struck sank under its wounds, while its faithful associate, disdaining to survive the loss, stretched itself upon the dead animal, sharing its fate." A more affecting instance, exemplifying the strength of maternal attachment, is related by Captain Scoresby. One of his harpooners struck a cub in the hope of capturing the mother (a plan, we are sorry to say, frequently made use of), who arose, and, seizing the young one with her paddle, dived instantly, dragging about a hundred fathoms of line out of the boat with considerable velocity. Again she arose to the surface, furiously darted to and fro; frequently stopping short, or suddenly changing her direction, and exhibiting every symptom of extreme agony. For a considerable length of time she thus continued to act, although closely pursued by the boats, but her concern for her offspring made her regardless of the danger by which she was surrounded. After two fruitless trials she was harpooned, but even then did not attempt to escape, notwithstanding her sufferings, but still clung to her offspring, and allowed the other boats to approach, so that in a few minutes three more harpoons were fastened, and in the course of an hour both the mother and cub were floating dead.

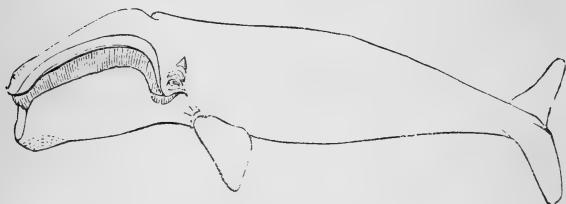
The female of this species produces only one cub at a birth, which remains under her care for a considerable period, until, by the development of the baleen plates, it is enabled to procure its own support. The whale usually lives in pairs, but sometimes numbers are seen together, in places to which abundance of food or other causes induce them to resort.

The unceasing persecution to which the Greenland whale has been long subjected has not only thinned its numbers, but driven it from localities in which it was formerly common. It is at present chiefly to be found in the icy seas of Spitzbergen, in Davis's Straits, Baffin's Bay, and the waters of the polar circle. General colour above, a velvety blackish gray; under parts, white.

An allied species, the Cape or Southern Whale (*Balæna Australis*, Cuv.), but not attaining to so large a size, inhabits the Southern Ocean, and in the month of June visits the bays of Africa adjacent to the Cape of Good Hope, for the purpose of bringing forth its young. It is, in fact, only the females that thus approach the coast, and they return to the main ocean in September. Two skeletons, brought by De Lalande in 1820, are in the museum of Paris, and the osteological differences between this and the Greenland whale have been described by Cuvier. The speculations of commerce have been directed to this representative of the northern mysticete, which at a future day may in like manner become driven from its old haunts to more remote abodes.

Fig. 110 is the outline of a species of *Balæna* (*Balæna Antipodarum*), tenanted the ocean near New Zealand. Of the mode of attacking the Greenland whale, and as conveying some idea of the dangers of the contest, we relate the following incident:—"Captain Lyons, of the *Raith* of Leith, while prosecuting the whale fishery on the Labrador coast, in the season of 1802, discovered a large whale at a short distance from the ship. Four boats were sent in pursuit, and two of them succeeded in approaching it so closely together, that two harpoons were struck at the same moment. The whale descended a few fathoms in the direction of another of the boats,

which was on the advance, rose accidentally beneath it, struck it with its head, and threw the boat, men, and apparatus about fifteen feet into the air. It was inverted by the stroke, and fell into the water with its keel upwards. All the people were picked up alive by the fourth boat, excepting one man, who, having got entangled in the boat, fell beneath it, and was unfortunately drowned."



110.—New Zealand Whale.

THE RORQUAL

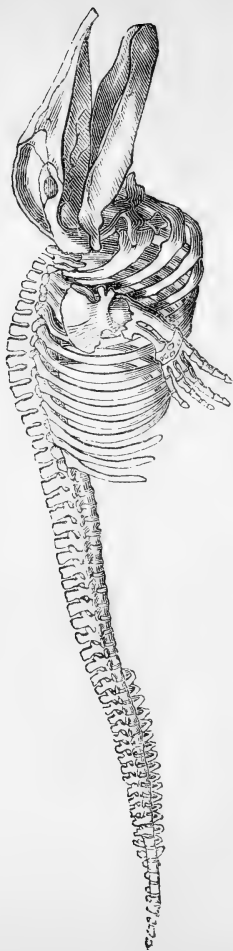
(*Balænoptera Boops*, Flem.; *Balænoptera Rorqual*, Lacép.).

The Rorquals, constituting the genus *Balænoptera*, differ from the Greenland whale and its allies in the possession of a small dorsal fin on the lower part of the back (not seen in the position of the pictorial specimen), and a series of longitudinal folds on the skin of the under surface of the body, and particularly the throat and chest. The plates of baleen are short. The food of these animals consists of fishes, and especially herrings and other species which go in shoals, and they engulf multitudes at once in the abyss of their capacious mouth. They are remarkable for the rapidity and ease of their movements: they dart along or dive with almost unequalled impetuosity, and are dangerous to attack. From this cause, as well as from the small quantity of blubber they afford, and the inferior quality of the ba-

leen, they are seldom chased by the crews of the whaling-vessels. The species do not seem to be as yet well determined.

The Great Rorqual is one of the largest, if not the largest, of this gigantic race of beings, often exceeding a hundred feet in length. Its native regions are the polar seas, where it is seen both in troops and pairs, the paired males and females exhibiting devoted attachment to each other. The rorqual is more restless, more suspicious, and fiercer than the common whale, and, when struck by the harpoon, descends with such velocity as often to snap the line. It was an individual of this species which, in the month of November, 1827, was stranded near Ostend, and of which the skeleton was subsequently exhibited in London and Paris. The length of the skeleton was ninety-five feet; the head measured twenty-two feet. The spinal column consisted of sixty-two vertebræ; the ribs were fourteen on each side. The expanse of the caudal paddle was twenty-two feet and a half. The opportunity of examining the internal anatomy of this animal was lost, a circumstance lamented in indignant but just terms by M. Van Breda, whose memoir on the subject is published in Cuvier's '*Histoire Naturelle des Cétacées*.' This writer states that, besides the usual plates of baleen, the animal had at the tip of its muzzle a thick tuft of rounded horny filaments, or rather coarse hairs, united at the root by a common membrane, and divided into finer threads at their points; these filaments were of different length, some exceeding three feet. This peculiarity had not, we believe, been previously noticed. The weight of this individual when captured was 480,000 pounds, and 4000 gallons of oil were extracted from the blubber. Weight of the skeleton alone, 70,000 pounds. Fig. 111 represents the skeleton.

Here we close our survey of the Cetacea. It is a class which yet requires much elucidation; its species are still involved in confusion, and of many almost everything is yet to be learned. They have seldom indeed been contemplated in their native regions by pro-



111.—Skeleton of Rorqual.

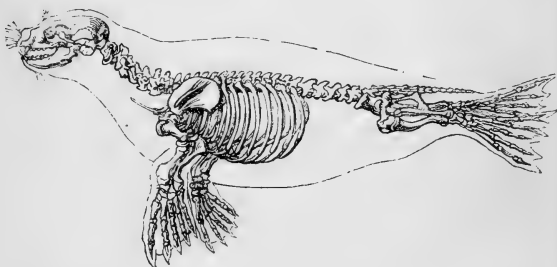
fessed naturalists—hence the changes they may (many of them, at least) undergo in their progress from youth to maturity, the duration of their lives, the rapidity of their growth, and many points in their economy are yet desiderata. Who has counted the years of the whale; who has marked an individual from birth, till, one of the patriarchs of its oceanic race, it has failed beneath the burden of ages? Who has tracked these colossal beings in their migrations, or patiently studied their nicer instincts, their less prominent manners and habits?—Their ways are hidden in the deep, and the little that we know of them is the result of accumulated but fortuitous observation, to which commerce has impelled a daring class of men, whose great object is their destruction. Much information will be doubtless added from time to time, but, after all, many points will necessarily remain beyond our powers of acquisition.

We may conclude by observing that the chase of the whale was carried on by the Norwegians as early as the ninth century, principally, as it would appear, for the sake of its flesh, which was accounted a delicacy. Formerly a species of whale abounded in the Bay of Biscay, and was killed by the inhabitants of the coast for the same object, till at length it was driven away from that bay by incessant persecution; the Biscayan mariners then carried the navigation farther and farther from their own shores, till at last they approached the coasts of Iceland, Greenland, and Newfoundland; and thus was commenced, in the course of the sixteenth century, the northern whale fishery as pursued in modern times; the object being not the flesh of the animal, but the blubber and baleen.

FAMILY—PHOCIDÆ (SEALS).

OF all four-limbed mammalia the seals (Phocidæ) are those which most display in every part of their organization a fitness for the watery element. The body is elongated and conical, tapering from the chest to the tail (see skeleton, Fig. 112), the pelvis being so narrow

as not to interrupt the gradual decrease. The spine is provided with muscles capable of inflecting it with considerable force. The clothing consists of short, stiff, glossy hairs, very closely set, and adpressed against the skin. The limbs are oars or paddles. The anterior pair have the humerus and fore arm so short, that little more than the paw alone advances from the body; this in reality consists of five fingers, but they are impacted in skin, the nails, which are flat, indicating their number. The hinder limbs are directed backwards, and terminate the body; the bones are short and strong, and the hip-joints want the ligamentum teres. The feet are broad-



112.—Skeleton of Seal.

webbed paddles, consisting of five toes, the central of which is the shortest, the outer one on each side the longest; when not in action the webs of these paddles are folded, and the toes in contact, but when brought into use they spread and present a broad surface. Between these paddles is the short and compressed tail. On land or masses of ice these animals are very awkward and clumsy, but they scuttle along by the action of the anterior paddles, dragging their hinder quarters after them, and manage to proceed with tolerable rapidity; they can also climb rocks and crags of ice.

The neck in these aquatic animals is very long and

singularly flexible ; the head is round, with a large full fleshy muzzle, furnished with long stiff whiskers ; the nostrils are valvular, and capable of being closed at will ; the eyes are large and dark, with a mild intelligent expression, and are adapted for subaquatic vision. The external ears are either wanting or very small, and the auditory orifice is valvular ; the tongue is almost smooth, and is abrupt and indented at its tip ; the brain is large, the lungs voluminous, the stomach capacious.

The internal arrangement of the venous system is very remarkable, and adapted so as to effect a sort of reservoir for the blood, which naturally accumulates in it when the circulation is impeded during the suspension of breathing, as is perpetually the case as the animals are pursuing their prey beneath the surface of the water. Between the skin, which is very tough, and the muscles, there intervenes a fibrous loose elastic tissue of a dark red tint ; indeed the muscles are dark, and the blood of a blacker hue than in most mammalia. From the anterior part of the breastbone (sternum) a long cartilaginous continuation projects forwards for the more extensive attachment of the voluminous muscles acting upon the anterior paddles. The arteries of the limbs are plexiform, as we have described them in the volume of the **MONKEYS**.

The varying forms of the skull in the Phocidæ will be easily appreciated by reference to our pictorial specimens. With respect to the teeth, we may describe them as prehensile ; they are not formed for grinding, but for seizing the slippery prey and dividing its flesh into large portions. Their number is very different in the different species, nor less so are the minor details of their structure. The incisors are six or four above, and four or two below ; the canines are large and strong ; the molars are either simply conical or furnished with cutting edges, and more or less deeply notched with a large central point. Without entering into any disquisition respecting the genera into which the seals are divided, and their arrangement—a point of the less importance, as our knowledge of the group is at present confessedly imper-

fect—we shall proceed at once to comment upon the specimens before us.

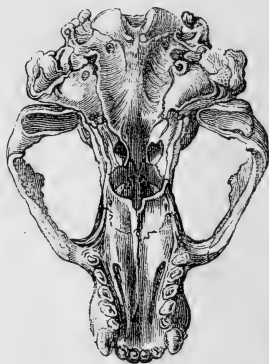
THE COMMON SEAL (*Phoca vitulina*);

Calocephalus vitulinus, F. Cuv.

Le Veau marin and Phoque commun of the French; Vecchio marino of the Italians; Lobo marino of the Spanish; Meerwolf and Meerhund of the Germans; Zeehund of the Dutch; Seelund of the Danes; Sial of the Swedes; and Moelrhon of the ancient British.



113.—Skull of Seal, upper view.



114.—Skull of Seal, lower view.

For the general characters of the skull in the genus *Phoca*, or *Calocephalus* of F. Cuvier, reference may be made to Fig. 113, an upper view; Fig. 114, an under view; and Fig. 115, a profile of the *Phoca Monachus*.

Fig. 116 illustrates the dentition. Molars, $\frac{5-5}{5-5}$.

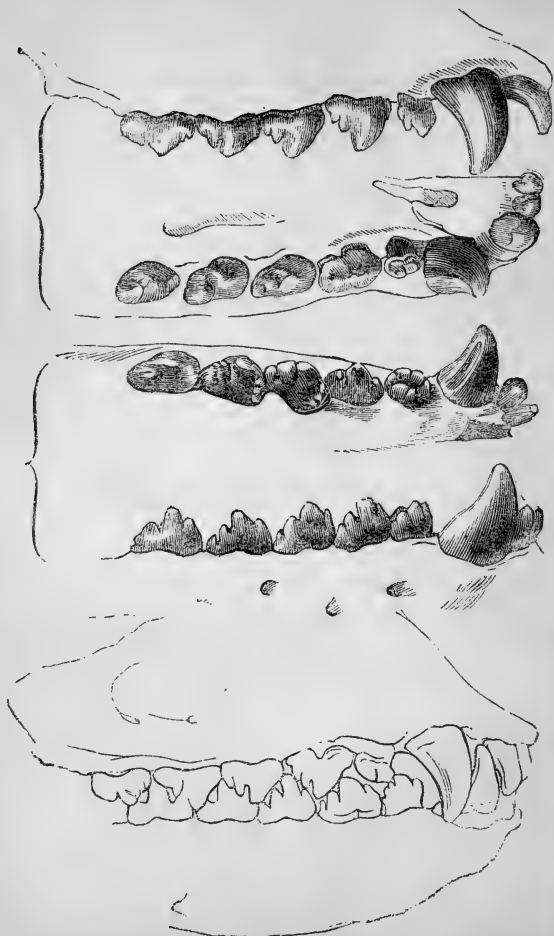
The *Phoca vitulina* of Linnæus has only within the last few years been disengaged from confusion; three

distinct species, according to Nilsson, having been included under that denomination, viz. *Ph. variegata*, *Ph. annellata*, and *Ph. leporina*. To the first of these the term *vitulina* is really applicable, and the term *variegata*, given by Nilsson, must be abandoned. The common seal is found along the shores of temperate Europe, and is common on many parts of the Scottish coast, and also of those of England and Ireland. It is gregarious in its habits, and haunts caverns and recesses among the rocks, to which the females retire to breed. The young are generally two in number, and the mother nurses them with great assiduity and affection, taking them out to sea very early. When surprised basking on the shore, which the seal often does, luxuriating in the sun, its first



115.—Skull of Seal.

effort is to make for the water; but, if intercepted, it shows fight, and with a growl turns on its adversary, who, unless he avoid the attack, is in some danger, for the animal has great power and weight (often two hundred and twenty-four pounds): having overset its antagonist, it shuffles to the water, and there disappears. All are familiar with Sir Walter Scott's humorous narrative of Hector MacIntyre's discomfiture by a "phoca." ('The Antiquary.') The voice of the seal is a gruff grunt, not unlike that of a pig, but when wounded it often utters a peculiar moaning sound. These animals are sagacious and watchful, and while half-slumbering on the beach their customary caution seldom leaves them,



116.—Teeth of Seal

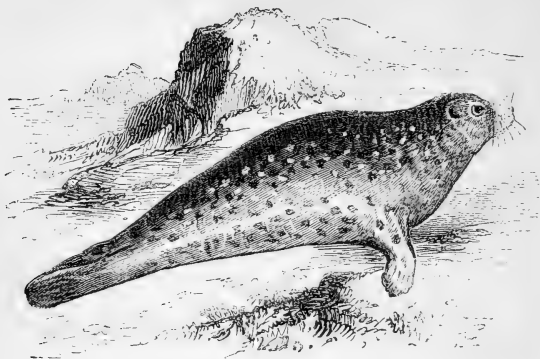
for one of their number is usually placed a little higher on the rock than the others, and he seems constantly awake, and ever and anon upraises his "grim feature," scenting the windward air. Flatfish, especially flounders, are the favourite food of this species, at least off the coast of Colonsay, where it is common. In the estuary of the Tees it makes great havoc among the salmon. This seal is hunted, as are others also, for the sake of its skin and blubber. The fishing commences in autumn, and is practised by means of nets stretched across narrow sounds where the seals are in the habit of swimming. In these nets they are entangled, but it is only the young that can be thus captured; the old ones are shot, or their recesses and caves are entered at night by boatmen with torches and bludgeons, upon which the animals, alarmed by the glare and the shouts of the men, rush tumultuously forward to sea, and, as they push along in confusion and terror, they are knocked on the head with clubs, the men being duly stationed for the purpose.

The common seal can remain under water for about five minutes, and swims so rapidly, that if alarmed it will proceed nearly half a mile during that period. The seal is intelligent and docile, and easily domesticated: it becomes attached like a dog to its master, and may be readily taught to assist in fishing. Many anecdotes respecting tamed seals are recorded. Few animals have a finer sense of hearing, and musical sounds appear to afford it great delight. Laing, in his account of a voyage to Spitzbergen, states that the violin, when played on board the vessel, would generally draw around it a numerous audience of seals, which would continue to follow it for miles. Sir Walter Scott alludes to the same curious fact in the following lines:—

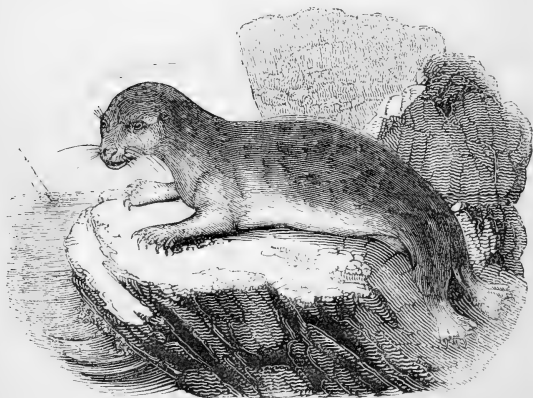
"Rude Heiskar's seals through surges dark
Will long pursue the minstrel's bark."

The common seal is from four to five feet in length; its colour is yellowish gray, more or less dappled and spotted with dusky brown. (Figs. 117 and 118.)

The seal is hunted in Scotland, but it is not the com-



117.—Common Seal.



118.—Common Seal.

mon seal; it is a much larger and fiercer species, viz. the gray seal, *Halichærus Gryphus* (*Phoca Gryphus*, Fabricius), which is also common round the Farn Islands. (See Mr. Selby's observations in 'Ann. and Mag. Hist. Nat.,' February, 1841, p. 462.) This species has till lately been confounded with another, viz. the *Phoca barbata*, which is rarely if ever seen on our coasts.

The gray seal is of great size, sometimes attaining the length of twelve feet, and producing upwards of twenty gallons of oil. It swims and dives with wonderful rapidity, but from its curiosity often comes within range of the rifle, for, as the boats approach it while reposing on the rocks or swimming on the water, it raises its head and remains for many minutes gazing at the objects of its attention. The gray seal has but little intelligence, and cannot be tamed. The young, which are produced in August, grow rapidly, and are able to follow their dams to the water within a fortnight after birth.

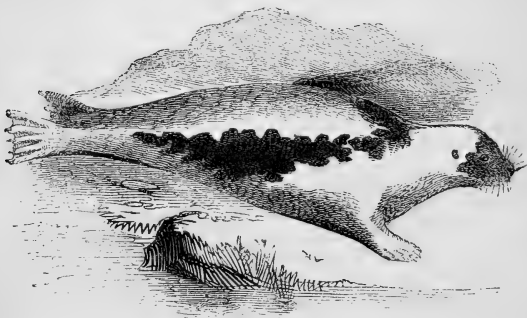
Mr. Newman, in his interesting 'Notes on Irish Natural History' ('Mag. Nat. Hist.,' December, 1839, p. 575), observes that "these seals are most abundant all round the coast of Cunnemara, from Galway to the Killyeries; indeed, I imagine, on every part of the coast of Ireland: they are strong, resolute, and ferocious animals, and totally different from the *Phoca vitulina*, which is in these respects the reverse. The *Halichærus Gryphus* grows occasionally to an enormous size, sometimes attaining even the length of twelve feet, and Mr. Ball, of Dublin, told me of one he had killed at Howth Harbour, which he believed to weigh five hundred pounds. *Phoca vitulina* occurs not unfrequently on the north coast of Ireland, and among the Scotch islands, but it appears to be nearly expelled from the southern half of Ireland by the more powerful and savage species above referred to." Mr. Selby records one killed in the Farn islands, weighing upwards of forty-seven stone, fourteen pounds to the stone.

The gray seal is stated by Nilsson to be solitary in the Baltic; but such is not the case either on the Farn islands or the coast of Ireland, where it tenants caves

and rocks, in parties of twelve or fourteen, or perhaps more. No doubt, like the common seal, it is often seen alone.

THE HARP-SEAL (*Phoca Grænländica*).

The native regions of this seal are the shores of Greenland, Newfoundland, Iceland, Kamtchatka, &c. It is one of the species in the chase of which the Greenlander encounters so many perils. Crantz, in his History of Greenland, states that it is there called Attarsoak. "It has a pointed head and big body, and is, when full-grown, nearly three yards long; it is then almost all of a white-gray colour, and has a black figure on its back like two half-moons, with their horns in a uniform direction towards one another. But there are others somewhat

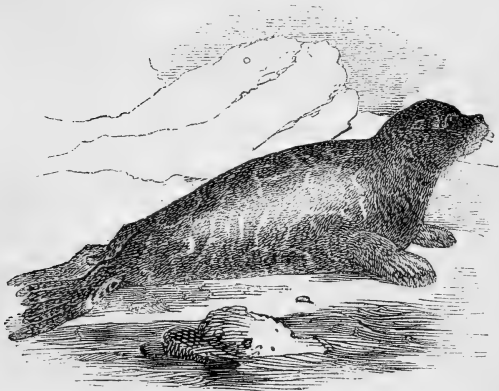


119.—Harp-Seal.

blackish all over. (Fig. 119.) All seals vary annually in colour till they are full grown, but no sort so much as this; and the Greenlanders vary its name according to its age. In the first year it is called Attarak, and is of a cream colour: in the second year, Atteisiak; it is then gray: in the third year, Aglektok; it is then painted: in the fourth year it is Milektok; spotted: in the fifth

year, Attarsoak; it then wears its half-moon, the signal of maturity."

It is singular that the Greenland seal, in its immature livery, occasionally visits the British shores, and also the coasts of France. In the 'Proceedings of the British Institution' for 1836 there is an account of two caught in the Severn; one captured on the coast of France lived for some time in the Jardin des Plantes at Paris. Fred. Cuvier, considering it a new species, gave it the title of *Calocephalus (Phoca) discolor*. Professor Nilsson also regarded the immature as a distinct species, and characterized it as such under the name of *Phoca annellata*. The titles, therefore, *discolor* and *annellata*, must both merge into *Grænlandica*.



120.—Immature Harp-Seal.

Fig. 120 is the immature Harp-Seal, the *Phoca discolor* of F. Cuvier, from a specimen which was captured on the coast of France, and lived for several weeks in the Paris Menagerie. M. F. Cuvier declares that he never knew any wild animal that was more easily tamed

or attached itself more strongly. When it first came to the Jardin des Plantes, it did its best to escape when M. F. Cuvier tried to touch it; but in a very few days its timidity vanished, and it rather courted his caresses than shunned them. In the same enclosure with it were two little dogs, and they amused themselves by mounting on the seal's back, barking, and even biting it: the seal, however, took it in good part, and seemed pleased with them, though it would sometimes give them slight blows with its paws, as if more to encourage their play than repress their liberties. When the little dogs made their way out of the enclosure, the seal tried to follow them, not deterred by the rough and stony ground. In cold weather they all three huddled kindly and warmly together. If the dogs snatched the fish from the seal's mouth when he was feeding, he bore it patiently; but he exhibited very different conduct to another seal, who shared his mess; for they generally had a fight over their meal, the combat ending, as usual, in the defeat of the weakest.

THE SEA-LEOPARD

(*Stenorhynchus leopardinus*): *St. Weddellii* Lesson; *Phoca leopardina*, Jamieson.

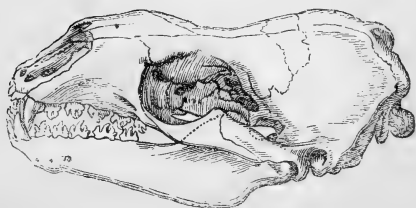
The genus *Stenorhynchus* is characterized by the prominence of the muzzle and the jagged form of the teeth, which have each a bold acute middle tubercle, and an anterior and posterior acute tubercle of smaller size, separated from the middle one by a deep notch. Claws very small.

Dental formula:—Incisors, $\frac{4}{4}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{5-5}{5-5} = 32$. (See Fig. 121.) Fig. 122 represents the skull of a species of *Stenorhynchus*.

Of the habits of the sea-leopard little is ascertained. It inhabits the South Shetlands (south of Terra del Fuego), in $60^{\circ} 37' S.$ lat., and attains to the length of eleven feet. The hair is soft and thin, grayish above,

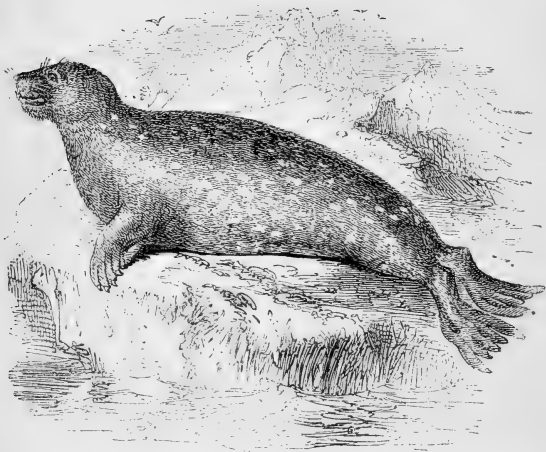


121.—Teeth of Sea-Leopard.



122.—Skull of Sea-Leopard

yellowish on the under parts: the whole of the upper surface is spotted with whitish. The claws are sharp, black, curved, and grooved. (Fig. 123.)

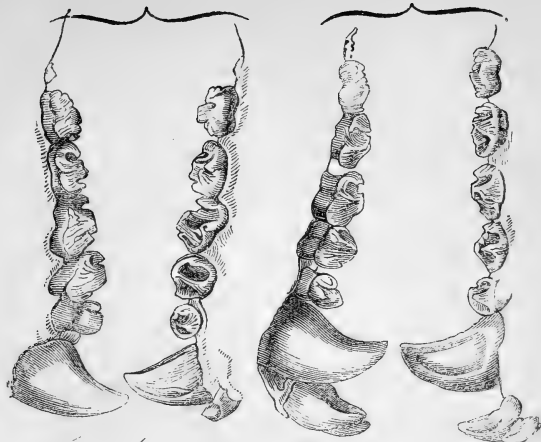


123.—Sea-Leopard.

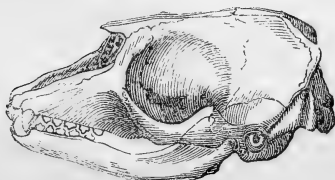
THE CRESTED SEAL (*Stenomatopoda cristatus*).

In the genus *Stenomatopoda* the head is surmounted by a curious hood-like appendage, the nature of which is not well understood. Molars with simple roots, short, wide, and striated only on the crown; muzzle narrow and obtuse. Dentition:—Incisors, $\frac{4}{2}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{5-5}{5-5} = 30$. (See Fig. 124.) Fig. 125 represents the skull.

The crested seal is a native of Greenland and various parts of the coast of North America. Crantz says it is called Neitsersoak by the Greenlanders, and also Clap-

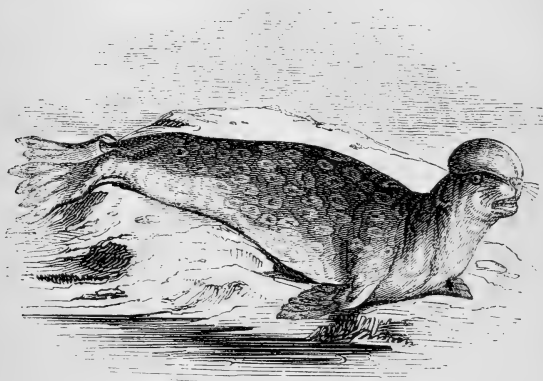


124.—Teeth of Crested Seal.



125.—Skull of Crested Seal.

nutz, from the "thick folded skin on its forehead, which it can draw down over its eyes like a cap to defend them against the storms, waves, stones, and sand." The apparatus consists of a cartilaginous crest which arises from the muzzle and increases rapidly in height as it passes backwards, being about seven inches high at its posterior edge, which is separated into two planes by an intervening depression an inch deep; this cartilaginous appendage is a development of the septum of the nose, and it runs into the hood or sac-like appendage of the



126.—Crested Seal.

head, which is strongly muscular, with circular fibres round its two orifices at the snout like nostrils, the true nostrils opening on each side of the cartilaginous crest beneath the hood, and are of an oblong figure. In the females and young the curious apparatus is undeveloped, being peculiar to the adult male. The eyes, which are capable of being drawn deeply into the socket during repose, are eminently formed for discerning distant objects. The fur is soft, long, and woolly beneath; in old indi-

viduals it is black, silvered on the under parts. In young animals it is gray, spotted irregularly with brown. The dilatable sac which crowns the head is covered with short brown hair. (Fig. 126.)

The crested seal attains to the length of eight feet. It haunts the open sea, and is said to visit the land chiefly in April, May, and June. These animals are commonly seen on large ice-islands, where they sleep without precaution. Great numbers are found in Davis's Straits, where they are stated to make two voyages a-year—in September and March. They depart to bring forth their young, and return in June very lean and exhausted. In July they proceed again to the north, where they appear to procure plenty of food, for they return in high condition in September. One male is lord of many females. They fight among themselves very desperately, inflicting deep wounds with the claws and teeth. Their bite is indeed very formidable. The voice of this seal is stated to resemble the bark and whine of a dog. Great numbers of the skins of this animal are brought to England, and it is one of those seals which are so valuable to the Greenlanders.

It is the *Phoca cristata* of Gmelin, the *Phoca leonina* of Fabricius.

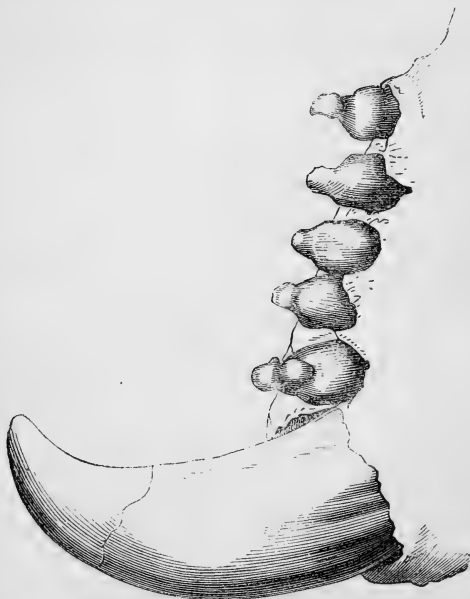
THE ELEPHANT-SEAL

(*Macrorhinus proboscideus*); Bottle-nose of Pennant; Phoque à trompe of Péron; Miouroung of the Australians.

In the genus *Macrorhinus* the males have the power of lengthening their large moveable snout into a proboscis resembling that of the tapir, through which, when excited, they respire violently. The teeth consist of four incisors above and two below, formed like the canines: the canines themselves are very large, conical, and recurved; the molars are $\frac{5-5}{5-5}$, with simple roots far exceeding in circumference the crowns, which are mere mamillary projections (see Fig. 127).

Fig. 128 represents the skull of *Macrorhinus*.

The whiskers are strong, coarse, long, and screw-twisted; the eyes are large and prominent; the paddles well developed, the nails small; hair short and close; its colour grayish or bluish gray, rarely blackish brown. Length from twenty to thirty feet, girth from fifteen to eighteen feet. In the female there is no proboscis; the colour is dark olive-brown above, passing into yellowish bay on the under parts. The hair lies in patches in all directions, giving a spotted appearance to the body somewhat like watered silk. No nails on the hind toes.



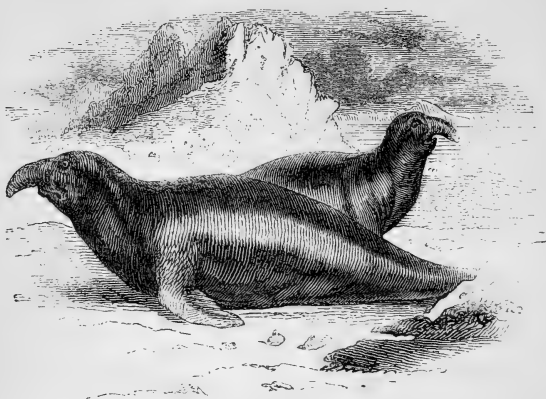
127.—Teeth of Elephant-Seal.

The elephant-seal is a native of the southern hemisphere, in the Atlantic, Pacific, and Southern Oceans, between 35° and 55° S. lat., Kerguelen's Land, South Georgia, Juan Fernandez, South Shetlands, and the Falklands. This huge seal lives in troops, which at certain seasons frequent various islands in the southern seas, especially where fresh-water lakes or swamps, in which they delight to wallow, are easily accessible. They are in fact migratory animals, advancing with the winter season towards the tropic of Capricorn, and towards the south in the summer. It is in the middle of June that they perform their first migration, covering, in countless multitudes, the shores of King Island, which, as the sailors report, are sometimes blackened by them.



128.—Skull of Elephant-Seal.

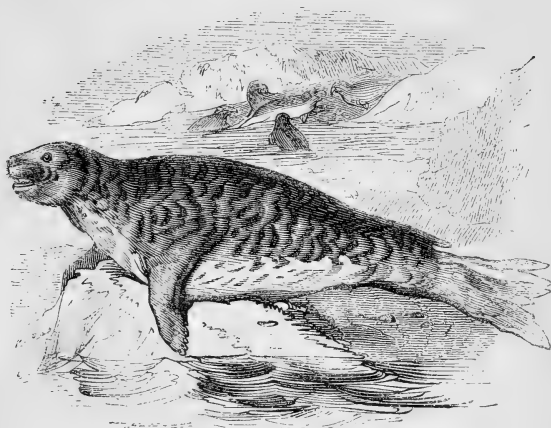
Here the females produce their young, and, as it is affirmed, the males form a line between the females and the sea, while the latter are nursing their cubs, in order to prevent the possibility of their deserting their charge, even for the shortest space of time. (Figs. 129 and 130.) The period of nursing and imprisonment lasts for seven or eight weeks, during which time the females are de-



129.—Elephant-Seals. Males.

barred from food, and become extremely emaciated: some, it is said, occasionally perish. The growth of the young is very rapid. After birth they measure between four and five feet, but in eight days are double their original dimensions, and in the third year are from eighteen to twenty-five feet in length. At this period the proboscis begins to be developed in the male. When the term of imprisonment has expired, the whole troop, young and all, visit the sea, where the females soon recover their strength and condition, and where they sojourn for about a month, when they again visit the shore, which now becomes the arena of most furious conflicts between the adult males, the females remaining passive spectators. When these scenes of bloodshed and excitement have ended, the troop, under the guidance of a leader, leave the shores of the islands in lat. 33° , and migrate southwards towards the antarctic circle, where they spend the summer months. It is observed, however, that a few remain in the former localities, even during the summer, probably in consequence of being disabled by.

wounds or debility from undertaking the ordinary journey. As soon as the frost commences in the low southern latitudes, the herds begin their return towards the tropic, and in July have arrived at their accustomed breeding-places.



130.—Elephant-Seal. Female.

Captain Carmichael, in his description of the island of Tristan d'Acunha (see 'Linn. Trans.,' vol. xii.), observes that a full-grown male will yield seventy gallons of oil; indeed, as they crawl along, their body trembles like a great bag of jelly. "These seals pass the greater part of their time on shore: they may be seen in hundreds lying asleep along the sandy beach, or among the long grass which borders the seashore. These huge animals are so little apprehensive of danger, that they must be kicked or pelted with stones before they make any effort to move out of one's way. When roused from their slumber, they raise the fore part of their body, open

wide their mouth, and display a formidable set of tusks, but never attempt to bite. Should this, however, fail to intimidate their disturbers, they set themselves at length in motion, and make for the water, but with such deliberation, that, on an excursion we once made to the opposite side of the island, two of our party were tempted to get upon the back of one of them and rode him fairly into the water." These animals taken young are easily tamed, and become very affectionate; one petted by an English seaman became so attached to his master from kind treatment for a few months, that it would come at his call, allow him to mount upon its back and put his hands into its mouth.

The voice of the male is deep, hoarse, and terrific, and may be heard at a great distance; that of the females and young is a kind of loud bellowing.

The food of the elephant-seal appears in great part to consist of cuttle-fish and seaweed, the beaks of the former and remains of the latter, often mixed with pebbles, being commonly found in the stomach.

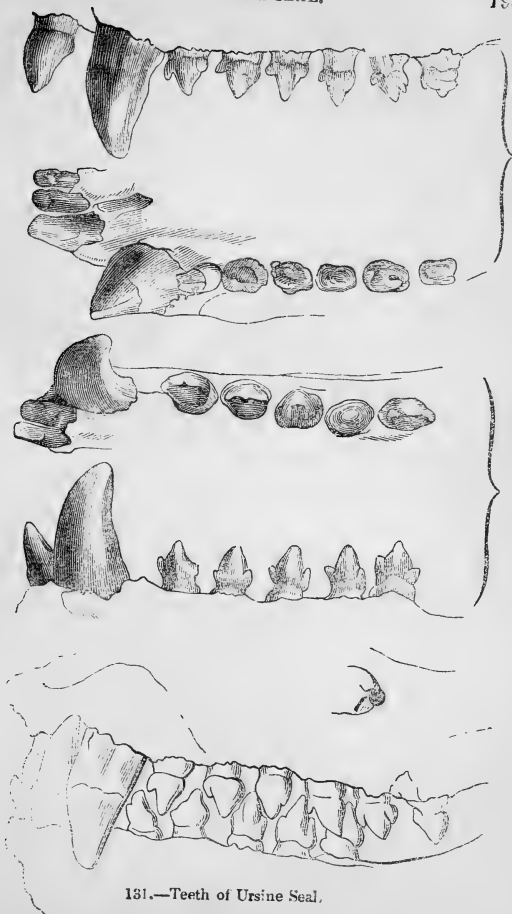
It is for the oil of this species principally, which, besides being yielded in great abundance, is clear and inodorous, that the seal-fisheries of the South Pacific are conducted. The skin, moreover, is valuable, from its strength and thickness, and is extensively used for carriage and horse harness. The flesh is oily and disgusting, but the tongues, when salted, are said to be very excellent.

THE URSINE SEAL

(*Arctocephalus ursinus*); *Phoca ursina*, Linn.; *Ursus marinus*, Steller; *L'OURS marin* of Buffon.

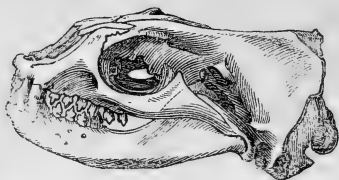
The characters of the genus *Arctocephalus* are as follows:—Head with a narrow retracted muzzle: the dentition thus: Incisors, $\frac{6}{4}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{6-6}{5-5}$ = 36 (see Fig. 131); small external ears. Fig 132 represents the skull of *Arctocephalus*.

The ursine seal attains the length of nearly eight feet;



131.—Teeth of Ursine Seal.

its fur is brown, washed with gray: it is long and erect, especially round the neck in old males, where the hair is two inches in length and stiff; there is beneath the hair a soft brownish-red wool close to the skin. (Fig. 133.) This species inhabits the islands on the north-west of America, Kamtchatka, the Kurile Islands, &c., and is migratory in its habits. When these seals appear off Kamtchatka and the Kuriles early in the spring, they are in high condition, and the females are pregnant. They remain on or about the shore for two months, during which the females bring forth. They are poly-



132.—Skull of Ursine Seal.

gamous, and live in families, every male being surrounded by a crowd of females (from fifty to eighty), whom he guards with the greatest jealousy. These families, each, including the young, amounting to 100 or 120, live separate, though they crowd the shore, and that to such an extent on the islands off the north-west point of America, that it is said they oblige the traveller to quit it and scale the neighbouring rocks. Both male and female are very affectionate to their young, and fierce in their defence; but the males are often tyrannically cruel to the females, which are very submissive. If one family encroaches on the station of another, a general fight is the consequence. They will not, in fact they dare not, leave their stations, for if they did they must encroach on that of some other family. Steller relates that he had been beset by these seals for six hours together, and was at last obliged to climb a precipice to get rid of the infu-



133.—Ursine Seal.

riated animals, at the imminent peril of his life. They have their war-notes and several other intonations. When amusing themselves on the shore they low like a cow, chirp like a cricket after a victory, and, when they are wounded, cry like a whelp. They swim very swiftly, and are as great a terror to other seals as the sea-lion (*Phoca jubata*, Gmel.) is to them.

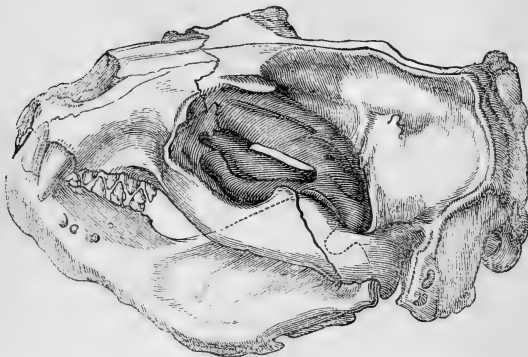
The skin of the ursine seal is very thick, and from its full deep fur makes excellent winter clothing. Steller speaks of a garment which he made for himself from one, when he was in Behring's Island, with grateful remembrance.

FORSTER'S SEA-LION

(*Platyrrhynchus Fosteri*); *Otaria Fosteri*, Less., in 'Dict. Class.;' *Phoca Forsteri*, Fischer.

The genus *Platyrrhynchus* differs little from *Arctocephalus*, except in a few minor points in the dentition,

in the greater elevation of the cerebral region of the skull, and in the enlargement of the muzzle. There are external ears. Fig. 134 represents the skull.



134. — Skull of Sea-Lion.

Several species of seal have been termed sea-bears or ursine seals; and several sea-lions, among which may be mentioned the huge elephant-seal already described. Dr. Hamilton considers, however, that three distinct members of the present genus have been thus designated: —1, the sea-lion of Steller (*Phoca jubata*, Gmelin), inhabiting the eastern shores of Kamtchatka and the Kurile Islands; 2, the sea-lion of Forster (*Leo marinus*, Buff.), a native of the southern hemisphere; and 3, the sea-lion of Pernetty (*Platyrrhynchus leoninus*, F. Cuvier), a native of the Falkland Islands.

Forster's sea-lion is a native of the southern seas, frequenting the Magellanic coast, Terra del Fuego, and the Magellanic Islands. The skin is thick, the hair reddish, yellowish, or dark brown; no fur or short wool under the long hair. A mane on the neck of the male reaches to the shoulders. Head small in proportion to the body,

which is everywhere equally thick-looking, as Buffon describes it, like a great cylinder, more suited for rolling than walking. Ears conical, about six or seven lines long; cartilage firm and stiff, but yet rather curled at the margin. Upper lip overhanging the lower, both furnished with long, coarse, black whiskers, which become white with age. Length from ten to fourteen feet; the females shorter and more slender. (Fig. 135.)



135.—Forster's Sea-Lion.

Captain Cook states that it is not at all perilous to go among these animals, for they either fled or stood still. The only danger was in going between them and the sea; for if they took fright at anything, they would come down in such numbers, that the person in the way would be run over. When he and his party came suddenly upon them, or waked them out of their sleep, they would raise up their heads, snort and snarl, and look

fierce, as if they meant to devour the intruder; but when the men advanced, the sea-lions always ran away. He states that the male is surrounded by from twenty to thirty females, and that he is very attentive to keep them all to himself, beating off every male that attempts to come to his flock. Others, again, had a less number, some no more than one or two; and here and there was seen one lying growling in a retired place, suffering neither males nor females to come near him. These he judged to be old and superannuated.

Forster relates that the rocks along the shore in New Year's Harbour were covered with multitudes of these sea-lions. "We put into a little cove under the shelter of some rocks," says he, "and fired at some of these fierce animals, most of which immediately threw themselves into the sea. Some of the most unwieldy however kept their ground, and were killed by our bullets. The noise which all the animals of this kind made was various, and sometimes stunned our ears. The old males snort and roar like mad bulls or lions, the females bleat exactly like calves, and the young cubs like lambs. They live together in numerous herds. The oldest and fattest males lie apart, each having chosen a large rock to which none of the rest dare approach without engaging in furious combat." Forster goes on to relate that they were often seen to seize each other with an indescribable degree of rage, and that many of them had deep gashes on their backs, which they had received in the wars. The younger active sea-lions, with all the females and the cubs, lay together. They commonly awaited the approach of the people; but as soon as some of the herd were killed, the rest precipitately fled, some females carrying off a cub in their mouths, while many were so terrified that they left the young behind. When undisturbed, they were often observed caressing each other in the most tender manner, and their snouts often met together as if they were kissing. The same author states that they come on shore on those uninhabited spots to breed, and that they do not feed during their stay on land, which sometimes lasts for several weeks; they then

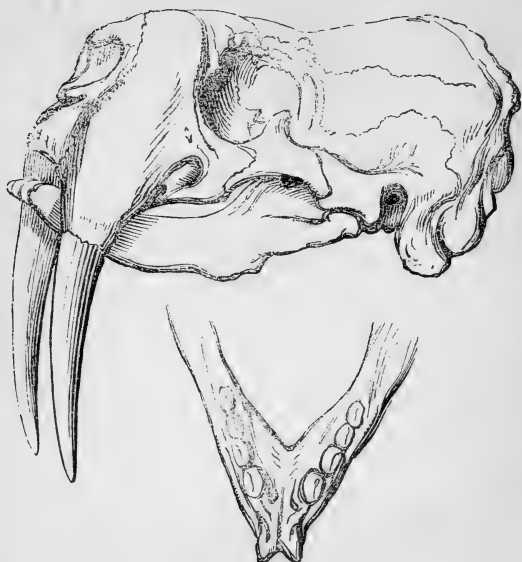
grow lean, and swallow a considerable quantity of stones to distend the stomach. He adds that the stomachs of many of them were found entirely empty, and those of others were filled with ten or twelve round heavy stones, each of the size of two fists.

THE WALRUS, OR MORSE (*Trichecus Rosmarus*).

Leaving the genuine seals, we come to the genus *Trichecus*, of which we are acquainted with only one species, the Walrus or Morse and Sea-cow of the British; Morse, Vache Marine, Cheval Marin, and Bête à la grande dent of the French. It is the Horse-whale or Whale-horse (*Hval-ros*) of Ochter the Norwegian, who, about the year 890, made his report of it to Alfred, as having in its teeth bones of great price and excellency, some of which he brought to the king on his return from his voyage beyond Norway; also Rosmar of the Norwegians; Morss or Morsh of the Russians; and Morsk of the Laplanders.

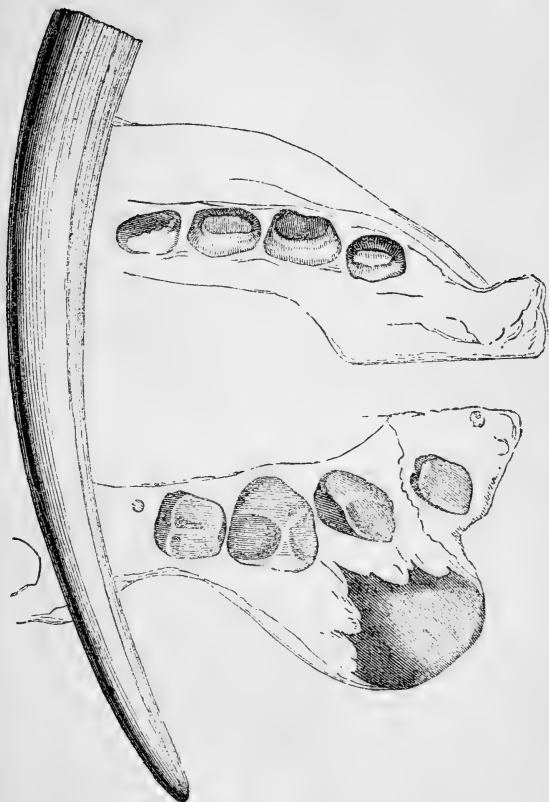
The walrus is a native of the polar regions of both hemispheres, and it is more than probable that the arctic animal is specifically distinct from the antarctic, though in habits and manners they agree precisely. The arctic walrus has occasionally visited the British shores, and is therefore figured by Mr. Bell in his 'History of British Quadrupeds,' though it can scarcely be accounted one of their number. In general form, no less than in habits, the walrus closely resembles the larger species of seals, but it differs from all the species of this group in the general contour of the skull and in the dental formula. Fig. 136 represents the skull and lower jaw; Fig. 137 the molars and a tusk of this animal.

The first peculiarity which strikes us in the skull of the walrus consists in the enormous magnitude of the canine teeth of the upper jaw, which are from eighteen inches to two feet in length, stout and solid, with large roots imbedded in protuberant alveoli, or sockets, occupying the anterior part of the muzzle, and rising above the cranium, which appears of disproportionate volume.



136.—Skull and Lower Jaw of Walrus.

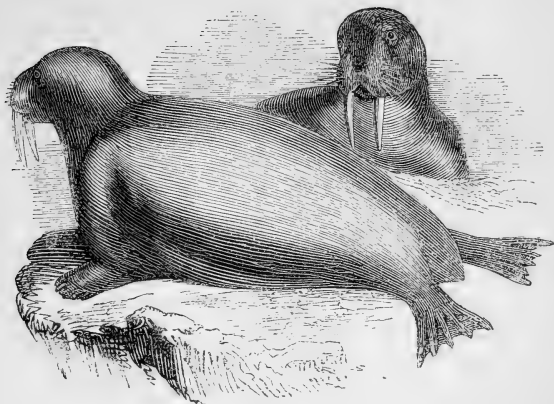
The immense development of the alveoli of these canines gives a swollen appearance to the face, which is increased by the tumid character of the lips, covered with thick wiry moustaches. The dentition is as follows:—Upper jaw : incisors four, of which the two middle are deciduary, falling out at an early period ; the two lateral have the character of molars. Of the enormous canines we have already spoken. Molars on each side four, cylindrical, short, and obliquely truncate. Lower jaw : incisors wanting ; canines wanting ; molars as in the upper jaw. The lower jaw is not only small in proportion to the general volume of the skull, but is compressed as it proceeds, in order to fit in between the huge canines of the upper



137.—Molars and Tusk of Walrus.

jaw, which sweep with a gentle curve perpendicularly downward. The nostrils, in consequence of the development of those imbedded in the maxillary bones, are thrown upwards, so as to open considerably above the muzzle with a vertical aspect. The eyes are small, but brilliant; the orifices of the ears are placed very far backwards on the head; the neck is short and thick; the chest of great volume; the tail short; the body thinly clothed with short stiff brownish hair; the hinder paddles are large. In length the walrus attains to fifteen or sixteen feet, and its body not only yields abundance of oil, but its skin is highly valued for its toughness and durability. The tusks of this animal, which remind us of those of the elephant, are instruments both of defence and of progression; by their aid it assists itself in clambering up floating icebergs, or in traversing the fields of ice along the shore, to which it resorts both to rest and breed. It uses them also with great effect in defending itself from the attacks of the polar bear, which may be regarded as its most formidable adversary, and with which it often engages in bloody conflicts. But there is also another use to which these tusks are destined: the walrus feeds to a great extent on a species of marine vegetable, the *fucus digitatus*, and these instruments are admirably calculated for tearing up the long wreaths of seaweed fast rooted in the bed of the ocean. Besides this vegetable, they also feed upon other aliment; Mr. Scoresby found in their stomachs shrimps, a kind of crayfish, and the remains of young seals. They are probably omnivorous. (Fig. 138.)

The walrus, like the seal, is gregarious in its habits, and is often observed in vast flocks reposing upon the ice, or upon rocky islands or sand-banks; on these occasions some appear to act as sentinels, and give notice of the approach of an enemy; their voice is a loud roar or bray, and may be heard at a considerable distance: Captain Cook observes that in the night or in foggy weather, the roaring of the walruses gave notice of the vicinity of the ice before it could be seen. When attacked or fired at, the whole troop rushes tumultuously



138.—Walrus, or Morse.

into the sea; should one be wounded, its companions hasten with loud cries to the rescue, and, emboldened by their numbers, assail the boat with great ferocity, and endeavour to upset or break it with their powerful tusks. The thickness and toughness of the skin render it no easy matter to drive a lance or harpoon into the animal's body, and a sharp weapon not unfrequently glances off without piercing. When wounded on shore, the morse turns furiously upon its adversary, striking right and left with its tusks, and endeavouring to dash him to the ground; then, roaring with pain and fury, it makes off into the sea, where it is joined by its companions. Zorgdrager, in his description of the Greenland fishery (1750), states that, before the morse had been so persecuted, large troops would often advance on the shore to a considerable distance from the edge of the water, so that it was easy to cut off their retreat, and the more so as the animals exhibited no alarm on seeing the approach of the hunters, who would often kill several before the

rest attempted to regain the sea. As is the case with the whale, the annual slaughter made among these animals for the sake of their oil, and of their tusks, which are of the finest ivory, has thinned their numbers, or driven them from haunts where they formerly abounded, to seek shelter in more inaccessible localities. That they are not without courage or sympathy for their wounded companions there is ample testimony. When Martens wounded one, others speedily surrounded the boat, and, whilst some endeavoured to pierce it with their tusks, others raised themselves out of the water and endeavoured to board her. Captain Phipps, afterwards Lord Mulgrave, relates that, when near a low flat island opposite Waygat's Straits, in 1773, two of the officers went in a boat in pursuit of sea-horses. They fired at one and wounded it. The animal was alone when it was wounded, but, diving into the sea, it brought back a number of others. They made a united attack upon the boat, wrested an oar from one of the men, and were with difficulty prevented from staving or oversetting her; but a boat from the Carcass joining that from the Racehorse, they dispersed. Captain Phipps adds that one of that ship's boats had before been attacked in the same manner off Moffen Island. Sir Edward Parry encountered about two hundred in Fox's Channel, lying piled as usual over each other on the loose drift-ice. A boat's crew from both the *Fury* and *Hecla* went to attack them, but they made a desperate resistance, some with their cubs mounted on their backs, and one of them tore the planks of a boat in two or three places. Their parental affection is great. Captain Cook states that on the approach of the boats, which were hoisted out to attack them in Behring's Straits, all the walruses took their cubs under their fins, and endeavoured to escape with them from the ice into the sea. Several whose young were killed and wounded, and were left floating on the surface, rose again and carried them down, sometimes just as the people were going to take them into the boat; and they might be traced bearing them to a great distance through

the water, which was coloured with their blood. They were afterwards observed bringing them up at times above the surface, as if for air, and again diving under it with a dreadful bellowing. The female, in particular, whose young had been destroyed and taken into the boat, became so enraged that she attacked the cutter, and struck her tusks through the bottom of it.

In the arctic regions the flesh of the walrus is held by the natives in great estimation; Sir Edward Parry remarks that the flesh was tolerably good, affording variety amid the ordinary sea-fare. The ivory is finer than that of the elephant; the skin makes excellent carriage-harness; and the oil is valuable, though only from twenty to thirty gallons are yielded by a single carcase; its blubber, as Crantz says, being white and solid like bacon, and a hand's breadth thick, but not giving out much fluid oil.

Seals' flesh, says Crantz, supplies the Greenlanders "with their most palatable and substantial food; the fat furnishes them with oil for lamp-light, chamber and kitchen fire; and whoever sees their habitations presently finds that, even if they had superfluity of wood, it would not be of use—they can use nothing but oil in them. They also mollify their dry food, mostly fish, with oil; and finally they barter it for all kinds of necessities with the factor. They can sew better with fibres of the seal's sinews than with thread or silk; of the skins of the entrails they make window-curtains for their tents, and shirts; part of the bladder they use as a float to their harpoons, and they make oil-flasks of the stomach. Neither is the blood wasted, but is boiled up with other ingredients and eaten as soup. Of the skin of the seal they stand in the greatest need, because they must cover with seal-skins both the large and small boats in which they travel and seek their provisions. They must also cut out of them their thongs and straps, and cover their tents with them, without which they could not subsist in summer. No man therefore can pass for a right Greenlander who cannot catch seals. This is the

ultimate end they aspire at in all their device and labour from their childhood up." To the Greenlander, then, the sea is his pasturage, where his flocks and herds are fed : the sea is his hunting-domain, where, in his light kajak, he skims over the waves :

“There tumbling in their seal-skin boat,
Fearless the hungry fishers float,
And from the teeming seas supply
The food their niggard plains deny.”

LIST OF ILLUSTRATIONS.

	Page		Page
Female Hippopotamus and Young	9	Boar Hunt	73
Skeleton of Hippopotamus . .	12	Boar-hunting in India . . .	75
Rhinoceros	16	Skull of the Hog	76
Indian Rhinoceros	17	Teeth of the Hog	77
Ditto	18	Domestic Hog	80
Skeleton of Rhinoceros . . .	21	Teeth of Phacochære . . .	84
Indian Rhinoceros	23	African Boar	86
Javanese Rhinoceros	25	Abyssinian Phacochære . .	89
Skull of Javanese Rhinoceros .	28	Skull of Fossil Adapis . . .	90
Sumatran Rhinoceros	29	Molar of Mastodon, not worn .	92
Black Rhinoceros and Young .	31	Molar of Mastodon, much worn	92
African Rhinoceros	32	Skeleton of Mastodon . . .	93
Rhinoceros Keitloa	39	Outline of Palæotherium magnum	96
White Rhinoceros	41	Outline of Palæotherium minus	96
Two-horned Rhinoceros . . .	42	Skeleton of Palæotherium magnum	97
Skull of Fossil Rhinoceros . .	44	Skeleton of Palæotherium minus	97
Skull of Daman	45	Skull of Palæotherium magnum	99
Skeleton of Daman	46	Molar Teeth of upper jaw of the same, seen from above . .	99
Hyrax	47	External view of part of the lower jaw of the same . .	99
Skull of American Tapir . . .	51	Teeth of Lophiodon	101
Teeth of Sumatran Tapir . . .	52	Anoplotherium	102
Skeleton of American Tapir .	53	Ditto	103
American Tapir	54	Lower Jaw of Dinotherium . .	104
Ditto	55	Skull of Dinotherium . . .	105
Young Tapir	56	Ditto	106
Teeth of Collared Peccary . .	60	Palatal view of Skull of Dinotherium	107
Collared Peccary	61	Molar Teeth of Dinotherium .	108
Babiroussa	64	Occipital condyles of Dinotherium	109
Head of Babiroussa, seen in Profile	65	Dinotherium	110
Skull of Babiroussa	65		
Teeth of Babiroussa	66		
Female Wild Hog and Young .	69		
Boar Hunt	71		

	Page		Page
Fossil Skull of Toxodon	112	Skull of Spmaceti Whale,	
Ditto	113	back view	158
Ditto	113	Inside Jaws of Greenland Whale	160
Part of lower jaw of Toxodon	113	Skull of Greenland Whale,	
Incisor of Ditto	114	in profile	161
Tooth of Toxodon	115	Skull of Greenland Whale,	
Ditto	116	upper view	161
Ditto	116	Skull of Greenland Whale, un-	
Femur of extinct Australian		der view, lower jaw removed	161
Pachyderm	120	Skeleton of Greenland Whale	163
Molar Tooth of ditto	120	Greenland Whale	164
Ditto	120	New Zealand Whale	168
Vascular Apparatus of Whale	127	Skeleton of Rorqual	170
Skeleton of Dugong	128	Skeleton of Seal	172
Skeleton of Manatee	128	Skull of Seal, upper view	174
Skull of Dugong	129	Skull of Seal, lower view	174
Skull of Manatee	129	Skull of Seal	175
Teeth of Manatee	130	Teeth of Seal	176
Teeth of Dugong	131	Common Seal	178
Dugong	132	Ditto	178
Manatee	134	Harp-Seal	180
Fossil Teeth of Zeuglodon	135	Immature Harp-Seal	181
Skull of Dolphin	137	Teeth of Sea-Leopard	183
Section of Head of Porpoise	138	Skull of Sea-Leopard	183
Teeth of Porpoise	141	Sea-Leopard	184
Common Porpoise	142	Teeth of Crested Seal	185
Skeleton of Porpoise	143	Skull of Crested Seal	185
Skull and Tooth of Narwhal	145	Crested Seal	186
The Narwhal	147	Teeth of Elephant-Seal	188
Beluga	150	Skull of Elephant-Seal	189
Spmaceti Whale	152	Elephant-Seals. Males	190
Skull of Spmaceti Whale, in		Elephant-Seal. Female	191
profile	154	Teeth of Ursine Seal	193
Skull of Spmaceti Whale,		Skull of Ursine Seal	194
seen from above	154	Ursine Seal	195
Spmaceti Whale	156	Skull of Sea-Lion	196
Lower Jaw of Spmaceti		Forster's Sea-Lion	197
Whale	158	Skull and Lower Jaw of Walrus	200
Skull of Spmaceti Whale,		Molars and Tusk of Walrus	201
seen from below	158	Walrus, or Morse	203

END OF VOL. III.

SKETCHES IN NATURAL HISTORY.

HISTORY

OF

THE MAMMALIA.

VOL. IV.

ORDERS—RODENTIA; EDENTATA.

WITH NUMEROUS ILLUSTRATIONS.

IN SIX VOLUMES.

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CONTENTS OF VOL. IV.



ORDER—RODENTIA.

	PAGE
The Squirrels	9
The Northern Gray and Black Squirrel	10
The Malabar Squirrel	12
The Rocky-Mountain Flying Squirrel	13
The Common Ground-Squirrel	17
Parry's Spermophile	18
The Alpine Marmot	20
The Bobac	23
The Quebec Marmot	24
Dormice	25
The Common Dormouse	25
The Garden Dormouse, or Lerot	29
The Cape Graphiure	30
The Jerboas	30
The Egyptian Jerboa	33
The Dark-banded Jerboa	38
The Labrador Jumping Mouse	40
The Cape Leaping Hare	42
Burton's Gerbille	45
Mitchell's Gerboa	48
The Common Mouse	49
The Barbary Mouse	55
Darwin's Mouse	58

	PAGE
The Long-tailed Field Mouse	62
The Short-tailed Field Mouse	63
The Harvest Mouse	66
The Hamster	69
The Caffre Broad-eared Rat	74
The Hydromys	75
The Economist Mouse	77
The Water-Rat	79
The Beaver	81
The Musquash	86
The Mole-Rat	89
The Canada Sand-Rat	91
The Camas pouched Rat	95
The Coast Rat	97
The Rabbit Cercomys	98
Cuming's Octodon	99
The Tucutuco	101
The Utia	105
The Coypu	109

FAMILY—HISTRICIDÆ.

The Common Porcupine	115
The Brazilian Porcupine	117

FAMILY—CHINCHILLIDÆ.

The Chinchilla	119
Cuvier's Lagotis	124
The Viscacha or Biscacha of the Pampas	128

FAMILY—DASYPROCTIDÆ.

The Dusky Paca	137
The Agoutis	139

	PAGE
The Common Agouti	142
The Black Agouti	144
The Acouchi	144
The Cavies	146
The Patagonian Cavy, or Mara	150
The Capybara	152

FAMILY—LEPORIDÆ.

The Common Hare	156
The Rabbit	159
The Syrian Hare	161
The Dwarf Pika	161



ORDER—EDENTATA.

SECTION I. LEAF-EATERS.

FAMILY—SLOTHS.

The Common Sloth, or Aï	165
-----------------------------------	-----

FAMILY—GRAVIGRADA.

Myiodon robustus	174
Scelidotherium	178
The Megatherium	181

SECTION II. INSECTIVOROUS EDENTATA.

FAMILY—LORICA.

The Pebá	191
The Mataco	193

	PAGE
The Poyou, or Weasel-headed Armadillo	194
The Tatouay	196
The Great Armadillo	197
The Pichiciago	199
The Aard-vark	205

FAMILY—TOOTHLESS ANT-EATERS.

The Great Ant-eater, or Ant-bear	208
The Tamandua	211
The Little Ant-eater	213
Genus Manis	215
The Short-tailed Manis	219
The Long-tailed Manis	219
Temminck's Manis	219

LIST OF ILLUSTRATIONS.

	Page		Page
Skull, Teeth, and Paws of Aplo-		Barbary Mouse	56
dontia	7	Darwin's Mouse	59
Malabar Squirrel	13	Long-tailed Field Mouse . . .	62
Teeth of Tamias	14	Short-tailed Field Mice . . .	65
Teeth of Sciurus	15	Harvest Mouse	67
Rocky-Mountain Flying Squir-		Ditto	68
rel	16	Teeth of Hamster	70
Parry's Sperrophile	19	Hamster	71
Alpine Marmot	21	Teeth of Caffre Broad-eared Rat	73
Ditto	22	Caffre Broad-eared Rat . . .	74
Bobac	23	Teeth of Hydromys	75
Quebec Marmot	24	Hydromys	76
Teeth of Dormouse	26	Teeth of Economist Mouse . .	78
Common Dormouse	27	Economist Mice	79
Ditto	28	Water-Rat	81
Lerot, or Garden Dormouse . .	29	Beaver	85
Cape Graphiure	31	Teeth of Musquash	87
Skull and Teeth of Dipus		Musquash	88
hirtipes	32	Mole-Rat	90
Skull and Teeth of Alactaga . .	34	Skull and Teeth of Canada Sand-	
Egyptian Jerboa	35	Rat	92
Ditto	36	Teeth of Canada Sand-Rat . .	93
Ditto	37	Canada Sand-Rat	94
Dark-banded Jerboa	39	Ditto	95
Teeth of Labrador Jumping		Camas pouched Rat	96
Mouse	40	Teeth of Coast Rat	97
Labrador Jumping Mouse . . .	41	Coast Rat	98
Teeth of Cape Leaping Hare . .	42	Rabbit Cercomys	99
Cape Leaping Hare	43	Teeth of Echymys	100
Skull and Teeth of Burton's		Skull of Cuming's Octodon . .	101
Gerbille	45	Cuming's Octodon	102
Burton's Gerbille	46	Tucutuco	103
Mitchell's Gerboa	48	Skull of Tucutuco	104
Teeth of Common Mouse . . .	50	Muzzle and Paws of Utia . .	106
Common Mouse	53	Utia	107
Ditto	54		

	Page		Page
Teeth of Coypu	109	Lower Jaw of Mylodon	176
Coypu	110	Right branch of the above; ex-	
Teeth of Hystrix	112	ternal view	176
Teeth of Erethizon	113	Tooth of Mylodon	177
Skull of Acanthion Javanicum	114	Ditto	177
Skull of Common Porcupine	114	Remains of Skull of Scelido-	
Common Porcupine	115	therium	179
Ditto	116	Dentition of Scelidotherium	179
Brazilian Porcupine	118	Ditto	180
Chinchilla	120	Skeleton of Megatherium	182
Ditto	121	Pelvis and Hind Leg of ditto	185
Skeleton of Chinchilla	122	Ungueal Phalanx of ditto	186
Skull of ditto	123	Tooth of ditto	186
Cuvier's Lagotis	125	Peba	192
Skeleton of ditto	127	Mataco	193
Skull of ditto	128	Weasel-headed Armadillo	195
Viscacha	129	Tatouay	197
Skeleton and Skull of ditto	132	The Great Armadillo	198
Skull of Paca	134	Extremity and Tail of Pichi-	
Upper Jaw of ditto	135	ciago	200
Lower Jaw of ditto	136	Pichiciago	201
Tooth of ditto	136	Skull of ditto	202
Dusky Paca	137	Upper view of ditto	202
Teeth of Agouti	140	Basal view of ditto	202
Common Agouti	143	Lower Jaw of ditto	203
Black Agouti	144	Cervical Vertebrae of ditto	203
Acouchi	145	Pelvis seen from behind	203
Teeth of Guinea-pig	147	Ditto seen from below	203
Teeth of Kerodon	148	Skeleton of Pichiciago	204
Patagonian Cavy	150	Vertebrae of Tail of ditto	204
Teeth of Capybara	153	Aard-vark	205
Capybara	155	Teeth of ditto	206
Teeth of Common Hare	157	Great Ant-eater	209
Dwarf Pika	162	Tamandua	212
Skeleton of Sloth	166	Little Ant-eater	214
Pelvis of ditto	167	Temminck's Manis	216
Skeleton of Unau	168	Skull of Short-tailed Manis	217
Sloth	169	Feet of ditto	218
Sloth. Mode of progression	170	Pelvis of ditto	220

SKETCH

OF THE

HISTORY OF THE MAMMALIA.

ORDER—RODENTIA.

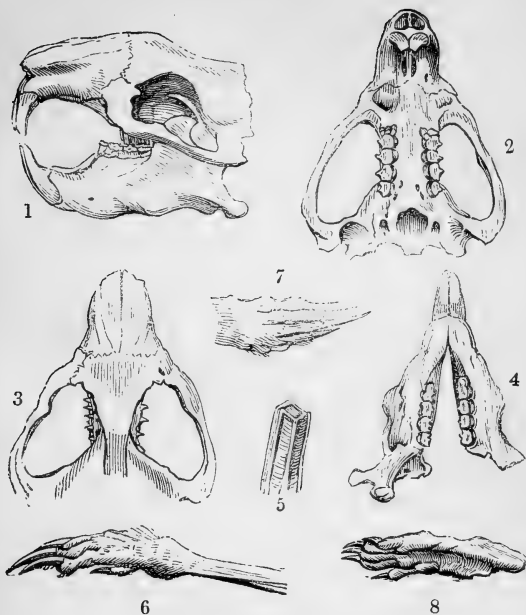
THE difficulty of instituting a natural arrangement (that is, an arrangement exhibiting the multiform links and affinities of different groups) is confessedly great; but peculiarly so as it respects the component parts of the present order. In itself, indeed, this order is definite, and based upon characters which form a clear line of separation between it and every other; but when we come to investigate the species it embraces, we soon feel ourselves perplexed among a multitude of forms, and begin to hesitate at every step. Hence it is that no two naturalists have arranged the Rodentia in the same manner; nay, Cuvier himself, in the last edition of his '*Règne Animal*,' set aside the principles by which in his earlier edition he was guided, and followed out other views.

Among those naturalists who have lately devoted their attention to the Rodentia, Mr. Waterhouse takes a foremost place; and his arrangement, founded on the truest philosophical principles, is a decided step in the advancement of this department of Zoology. It would be out of place, in a work like the present, to follow this naturalist through his train of researches, but we may give an outline of their results. Mr. Waterhouse considers

that the Rodents resolve themselves into three great primary sections : first, the Murine section ; secondly, the Hystricine section ; and thirdly, the Leporine section.

Each of these sections embraces several families, each of the latter comprehending several genera. The principal genera contained in the *Murine* section are—*Sciurus*, *Arctomys*, *Spermophilus*, *Tamias*, *Myoxus*, *Dipus*, *Mus*, *Arvicola*, *Geomys*, and *Castor*. The principal genera contained in the *Hystricine* section are—*Bathurgus*, *Orycterus*, *Poephagomys*, *Octodon*, *Abrocoma*, *Myopotamus*, *Capromys*, *Echinmys*, *Aulacodus*, *Histrix*, *Dasypsecta*, *Chinchilla*, *Cavia*, and *Hydrochærus*. The *Leporine* section contains the genera *Lepus* and *Lagomys*.

Respecting a few genera, as *Ctenodactylus*, *Helamys*, *Otomys* (Smith, not F. Cuvier), *Akodon*, and *Heteromys*, Mr. Waterhouse has not been able to satisfy himself as to their precise systematic classification ; and with respect to the genus *Aplodontia* (Fig. 1, skull and teeth), though he places it in the squirrel family (*Sciuridæ*), yet it differs, as he admits, in the absence of a post-orbital process to the skull, and in the molar teeth being rootless. We may here remark that the genus *Aplodontia* contains a Rodent, called by Lewis and Clark the Sewellel (*A. leporina*), and which inhabits the neighbourhood of the Columbia river (N. America), where it lives in burrows, and associates in small companies. The head is large, the nose is thick and obtuse, covered with a dense coat of short fur ; eye very small ; ear resembling the human in form. Body short, thick, and rabbit-like. Legs very short, and covered down to the wrists and heels with fur similar to that on the body : a little above the wrist-joint, on the inner side, is a small tuft of stiff white hairs. Fur like that of a rabbit out of season, amber and chestnut-brown above, grayish or clove-brown beneath ; lips whitish ; a rather large spot of pure white on the throat ; some white hairs dispersed through the fur. Tail slender, cylindrical, hardly half an inch long. The figure (1) represents the skull, teeth, and paws : 1, anterior half of skull with lower jaw, profile ; 2, anterior half of skull seen from below ; 3, the same



1.—Skull, Teeth, and Paws of Aplodontia.

seen from above ; 4, lower jaw with right condyle broken, seen from above ; 5, upper molar tooth ; 6, 7, fore foot, upper surface ; 8, sole of hind foot.

The Rodentia, as the name implies, have the teeth constructed for gnawing, paring, or scraping down the substances on which they feed. The teeth are only of two kinds, incisors and molars. There are no canines ; and between the incisors, which project from the very apex of the jaws, and the molars, which are situated far back, there intervenes an unfilled space of considerable extent. The incisors are universally two in number in

each jaw (if we except the hares and rabbits, in which two minute incisors rise at the back of the large permanent ones) : these are strong, compressed, and somewhat curved, with sharp chisel-shaped edges. It is only their anterior surface that is covered with a thick layer of enamel, and this layer forms the cutting edge, as does the layer of steel on softer metal composing a common chisel. Their insertion into their sockets is very deep, but the inserted part is not a true root : these incisors spring from a pulpy germ at their base, from which they are perpetually growing, and this growth bears a due proportion to the rapidity with which their cutting edges wear away by use. So imperative is this law, that, where one incisor is lost by accident, its opposite, having no countercheck, keeps increasing, till it acquires an enormous development, to the annoyance, and often the destruction, of the sufferer. With regard to the molars it may be observed that they differ in number in different species : they are, however, generally characterised by a flat surface ; traversed transversely by ridges of enamel, their structure being composed of perpendicular folds of this substance, compacted together by intervening osseous matter ; but further than this, we find in different species a structural distinction of physiological importance : in some, as the *Arvicolidæ*, they resemble the incisors, having no true solid roots, but are perpetually growing as their surface wears away ; in others, on the contrary (as the squirrels), at a certain period they gain truly formed roots, and after this cease all further growth. In the Rodentia the upper lip, which is cleft longitudinally, is in many species an organ of prehension ; or at least is of great importance in gradually transmitting the food into the mouth, as may be seen when we offer the rabbit a leaf or a stalk of clover or dandelion. The pharynx, or back of the mouth, is contracted, and in some species funnel-shaped, and capable of being closed by a circular muscle, in order that the food may pass gradually, as it becomes duly ground to pulp between the molars. The structural organisation of the Rodents, as evidenced by the characters of the skull, the bird-like

condition of the brain, and by other points, is at a low par, and the ratio of their intelligence is in a parallel degree. We may tame them, but we cannot educate them. They are all timid and feeble, and trust for self-protection to flight or concealment. The prey of ferocious beasts and birds and reptiles, their fertility, by a wise provision, counterbalances their annual diminution. Spread over the earth, from the equator to the coldest latitudes, they tenant rocks and mountains, plains and woods, feeding on grain and vegetables, and often devastating the cultivated domains of man. To a vegetable diet some few, as the rat, add animal food also. Most are nocturnal or crepuscular in their habits; many dwell in burrows, some conceal themselves amidst herbage, some amongst the foliage of trees, and some build for themselves habitations which have excited the interest and admiration of man.

In noticing the numerical abundance of the Rodentia, throughout the different quarters of the globe, it should be observed that in Australia six or eight species are all that we are acquainted with belonging to that region; Europe, North America, and South America are nearly equal as to the number of species they contain. India and Africa are also nearly equal, but they contain fewer species than either of the other provinces. The squirrels, rats, porcupines, and hares are the only groups found in all the provinces; all the rest of the groups are respectively confined to their own particular geographical province. The naturalist will find some important observations on the Rodentia by Mr. Waterhouse, in the 'Zool. Proceeds.,' for 1839; in the 'Zool. of the Voyage of H.M.S. Beagle;' and in the 'Mag. of Nat. Hist,' New Series, 1839, p. 90.

THE SQUIRRELS (Family *Sciuridæ*).

These elegant animals are found in every quarter of the world, Australia excepted. The general characters of the true squirrels (*Sciurus*), as exhibited by our well-known British species, are familiar to all: its fine full

eyes, its light contour, its activity, its deep soft fur, and long bushy tail, have contributed to render it a general favourite. They are furnished with proper clavicles, or collar-bones, and possess the use of the fore-arm and paws in a high degree of perfection; the toes are four, with the rudiment of a thumb, on the anterior feet; five on the hind feet; the claws are sharp and hooked. Mo-

lars, $\frac{5-5}{4-4}$. Ears often tufted with a pencil of long

hairs. In feeding, these animals sit up on the haunches, and hold their food (nuts, &c.) not between the fingers of their joined fore paws, but between the rudimentary thumbs, while they work at it with their teeth.

THE NORTHERN GRAY AND BLACK SQUIRREL

(*Sciurus leucotis*).

It is to Dr. Bachman, D.D., President of the Lit. and Phil. Soc., Charlestown, S. Carolina, that we are indebted for clearing up the maze of confusion in which the squirrels of America have been involved.

It appears from this author that several black squirrels exist, totally distinct from each other, and that of these some are mere varieties. Of the genuine species he notices the large Louisiana black squirrel (*S. Audubonii*), the black squirrel (*Sciurus niger*, Linn., not Catesby), and the dusky squirrel (*S. nigrescens*). There is a black variety of the fox squirrel (*S. capistratus*), and a black variety of the Northern gray squirrel, the species figured. The gray squirrels are numerous, and perplexing to the naturalist. The Northern gray squirrel has been, for instance, confounded with the Carolina gray squirrel, from which it is distinct. The Northern gray and black squirrel is a very common species, and exceedingly active and sprightly. It is spread through the Northern and Middle states: it is abundant in New York and in the mountainous parts of Pennsylvania, and extends as far north as Hudson's Bay: southwards, it occurs in Virginia, and perhaps still farther south.

Like all the true squirrels, this species is arboreal in its habits, quick, and alert:—it rises with the sun, and continues industriously engaged in search of food during four or five hours in the morning, running over logs, ascending trees and playfully coursing from limb to limb. During the warm weather of spring it prepares its cradle or nest on the branch of a tree, constructing it of dried sticks which it breaks off, or, if these are not at hand, of green twigs as thick as a finger, which it gnaws from the boughs. These it lays in the fork of a tree or of some large branch so as to make a framework: it then lines this framework with leaves; and over these again spreads a layer of moss. In the preparation of this nest, a pair is usually engaged for an hour in the morning, during several successive days, and the noise they make in cutting the branches and dragging the leaves may be heard at some distance. In winter they reside entirely in holes of trees, where their young in most instances are brought forth. The young are from four to six in number; and in a few weeks are sufficiently advanced to leave their nest. It is generally believed that this squirrel lays up a great hoard of food as a winter supply, but Dr. Bachman doubts the fact, though he admits that other northern species do. Further he states that the species which inhabit the southern portion of the United States, where the ground is seldom covered with snow, derive in winter a precarious subsistence from seeds, insects, and worms, which are scratched up among the leaves. We may here observe that, singularly enough, no one has noticed the fact, excepting Mr. C. Coward ('Mag. Nat. Hist.,' New Series, June, 1839, p. 311), of our common British squirrel being carnivorous as well as frugivorous; such is, however, the case: it attacks young birds and greedily devours them, nor is even the wood-pigeon safe from its assaults. The Northern gray squirrel feeds on nuts and various seeds, but it seems to prefer the shell-bark (*Carya alba*) and the several species of hickory to any other food. Green corn and young wheat suffer greatly from its depredations, and hence a war of wholesale destruction is everywhere

waged against it. In Pennsylvania an old law existed offering threepence a head for every squirrel destroyed, and in 1749 the enormous sum of 8000*l.* was paid out of the treasury for the destruction of these depredators. The extensive migrations which are undertaken by this species, either from a scarcity of food or from some other inexplicable cause, have often excited not only wonder, but apprehension. They generally take place in autumn, but by no means with regularity. It would appear that in the far north-west multitudes congregate in different districts, forming scattered troops, which all bend their way instinctively in an eastern direction, collecting into larger bodies as they proceed; neither mountains nor rivers stop their progress: onward they come, a devouring army, laying waste the corn and wheat fields of the farmer; and as their numbers are thinned by the gun, others fill up the ranks: few, perhaps none, ever return westwardly; those that escape the carnage take up their abode in the forests of their newly-explored country. The gray squirrel has many enemies; the fox, the lynx, the weasel, hawks, and owls are all eager to seize it: when attacked by the red-tailed hawk, its most formidable foe, it is amusing to see the skill and dexterity exercised by both, in the attack, and in the defence; often, indeed, the squirrel, by dodging and twisting round the branches and large limbs of the tree, foils and wears out his antagonist; when, however, a pair of hawks combine, the squirrel has no chance.

THE MALABAR SQUIRREL (*Sciurus maximus*).

Of the Indian squirrels, one of the finest is the Malabar squirrel, measuring fourteen or fifteen inches in the length of the head and body, and somewhat more in that of its full bushy tail. (Fig. 2.) This species is found in Malabar, and also in Ceylon. Like the rest of its tribe, it is eminently arboreal, tenanting the summits of palm-trees, and feeding to a great extent upon the cocoanut, to the milk of which it is said to be very partial. We have seen several specimens in captivity. They



2.—Malabar Squirrel.

soon become tame and familiar, but are not to be trusted too far: their bite is very severe. General colour above, rich chocolate, deepening about the shoulders into black; under parts abruptly pale reddish yellow; ears tufted with a long full brush.

THE ROCKY-MOUNTAIN FLYING SQUIRREL

(*Pteromys Alpinus*, or *Pt. Sabinus*, var. β , Richardson).

The flying squirrels (*Pteromys*, Geoffr.; *Sciuropterus*, F. Cuv.) agree in the general characters of their dentition with the rest of the family (see Fig. 3 for the teeth of *Tamias*, and Fig. 4 for the teeth of *Sciurus*). The

incisors are laterally compressed: the molars, $\frac{5-5}{4-4}$, rarely $\frac{4-4}{4-4}$, are equal in size or nearly so, excepting

the anterior molar of the upper jaw, where they are 5—5, which is smaller than the rest. The series of molars on each side are widely separate and parallel. It is in the possession of a lateral fold of skin, forming, when extended, a parachute, enabling them to take long sweeping leaps, that the flying squirrels are distinguishable from the ordinary group. These expansions are

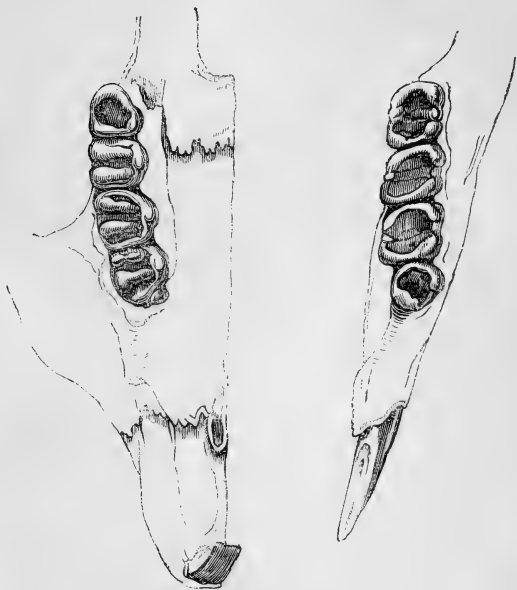


3.—Teeth of *Tamias*.

fully clothed with soft fur; and they usually project in a pointed form from each wrist, being there supported by a long slender osseous stylet. In some species, as the one figured, this is either reduced to a mere tubercle or wanting. (Fig. 5.)

The flying squirrels are conspicuous for the rapidity of their evolutions: they ascend the trees with such ve-

locity that the eye can scarcely follow them; and they skim from one tree to another, or precipitate themselves to the ground, with singular agility. In their habits they are nocturnal.



4.—Teeth of *Sciurus*.

These elegant animals are respectively natives of the northern regions of Europe, the north of Asia, the north of America, and the glowing islands of the Indian Archipelago. The present species is one of the American flying squirrels, and was discovered by Mr. Drummond on the Rocky Mountains, where it lives in dense pine-



5.—Rocky-Mountain Flying Squirrel.

forests, seldom venturing from its retreat except in the night. Dr. Richardson received specimens from the Elk river, and also from the south branch of the Mackenzie. Whether it is a mere variety of the *Pt. Sabrinus* or a distinct species is not clear.

Its general colour is yellowish-brown above. The tail is flat, longer than the body, and blackish-gray. Total length fourteen inches three lines, of which the tail, including the fur, measures six inches three lines.

THE COMMON GROUND-SQUIRREL

(*Tamias striatus*).

Unlike the true squirrels, the ground-squirrels are chiefly terrestrial in their habits, and are furnished with cheek-pouches, in which they carry food to their retreats, forming magazines for winter. They live in burrows, but do not appear to become torpid. Their fur is shorter and closer, and the tail less bushy, than in their arboreal relatives. These animals are chiefly spread through the northern and temperate regions of Europe, Asia, and America. The palm-squirrel of India, and the Barbary squirrel, though associated by some authors with the ground-squirrels, occupy an intermediate situation between the latter and the true arboreal species.

The common ground-squirrel is a native of the north-eastern part of Europe and the north of Asia. It is the *Ecureuil Suisse* of the French, so called because its striped back has some resemblance to a Swiss doublet. According to Pallas, these striped squirrels dig their burrows in woody places, in small hummocks of earth, or near the roots of trees; but never, like the common squirrels, make their nests in the trunk or branches, although when scared from their holes they climb with facility, and make their way from branch to branch with great speed. A winding passage leads to their nest, and they generally form two or three lateral chambers to store their food in. The striped squirrel in its manners, and from having cheek-pouches, is allied to the hamster and citillus (type of the genus *Spermophilus*), and is

likewise connected with the latter by its convex nose, proper for an animal accustomed to dig. In its whole habit it differs from the squirrels which live in trees, and forms, with other striped squirrels, a division of the genus. It has a longer head than the common squirrel; rounded ears, not tufted; a roundish, hairy tail, which it less frequently turns up; a slender body, and shorter limbs. The fur likewise is very short, and less fine. Yet in its diurnal habits, and in not becoming torpid in winter, it comes near the squirrels: it is difficult to tame.

PARRY'S SPERMOPHILE (*Spermophilus Parryi*).

The genus *Spermophilus* is intermediate between the ground-squirrels and the marmots. Besides possessing cheek-pouches, the Spermophiles are distinguished by the closeness of the ears, the slender form of the body, which is squirrel-like, and the narrowness of the paws. (Fig. 6.)

Two species are natives of eastern Europe, viz. the Souslik of the Volga, and the Zizel or Suzel of Hungary, Poland, &c., which are, perhaps, mere varieties. Many species are American, one of which, Parry's *Spermophile*, is the species figured.

Colour of the body above, a mixture of white thickly spotted on a gray or black ground; face chestnut; under parts rust-brown; tail with a narrow white margin, and black at the extremity. This, according to Dr. Richardson, who first named the species, is the Ground-Squirrel of Herne; the Quebec Marmot of Forster; the Seek-Seek of the Esquimaux; the Thœ-thiay (Rock Badger) of the Chepewyans; and the *Arctomys Alpina* of Parry's 'Second Voyage.'

Dr. Richardson states that it inhabits the Barren Grounds skirting the sea-coast from Churchill in Hudson's Bay round by Melville Peninsula, and the whole northern extremity of the continent to Behring's Straits, where specimens precisely similar were procured by Captain Beechey. It is abundant in the neighbourhood of Fort



6.—Parry's Spermophile.

Enterprise, near the southern verge of the Barren Grounds, in lat. 65° , and is also plentiful on Cape Parry, one of the most northern parts of the continent. It is found generally in stony districts, but seems to delight chiefly in sandy hillocks amongst rocks, where burrows, inhabited by different individuals, may be often observed crowded together. One of the society is generally observed sitting erect on the summit of a hillock whilst the others are feeding in the neighbourhood. Upon the approach of danger he gives the alarm and they instantly hurry to their holes, remaining however chattering

at the entrance until the advance of the enemy obliges them to retire to the bottom. When their retreat is cut off, they become much terrified, and, seeking shelter in the first crevice, they not unfrequently succeed only in hiding the head and fore part of the body, whilst the projecting tail is, as is usual with them under the influence of terror, spread out flat on the rock. Their cry, in this season of distress, strongly resembles the loud alarm of the Hudson's Bay squirrel, and is not very unlike the sound of a watchman's rattle. The Esquimaux name is an attempt to express this sound. Herne states that they are easily tamed, and very cleanly and playful when domesticated. They never come abroad during the winter. Their food appears to be entirely vegetable; their pouches being generally filled, according to the season, with tender shoots of herbaceous plants, berries of the alpine arbutus, and of other trailing shrubs, or the seeds of grasses and leguminous plants. They produce about seven young at a time.

The true marmots (*Arctomys*) are thicker, more robust, and less elegant in figure than the *Spermophiles*; the head is broad and flat, and the muzzle obtuse; the limbs are short, and there are no cheek-pouches.

THE ALPINE MARMOT (*Arctomys marmota*).

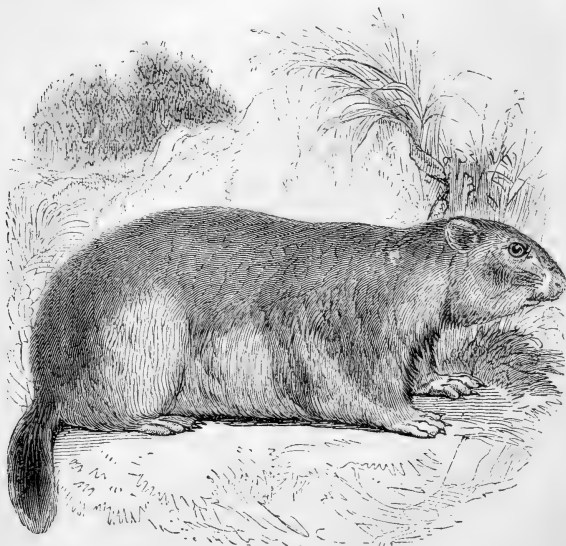
This well-known species is common in the high mountain districts of Europe, where it takes up its abode just below the line of perpetual snow, excavating a deep burrow, to which it has recourse on every appearance of an enemy. In this, which it lines with dried grass, moss, &c., it hybernates during the severity of the season. The burrows of the marmot are always constructed in dry situations, and mostly on declivities exposed to the south or south-east. They are of considerable extent, and are worked out and tenanted by families consisting of from five to fifteen individuals. They begin by a passage which runs for about six feet, and is just capable of admitting the animal's body. From the farther end



7.—Alpine Marmot.

of this gallery two others bifurcate, one of which, according to Desmarest, leads to a sort of chamber in the form of an oven, from three to seven feet in diameter; the other ends abruptly, and serves as a storehouse for dried grasses, &c. According to some, these passages are not always to be met with, and MM. Geoffroy and F. Cuvier assert that the cell is at the end of the first gallery. During the summer months groups of these animals may be seen feeding and sporting on the mountain-side. (Fig. 7.) They never wander to any great distance from their burrows, and have always one or more of their number posted as sentinels, which by a piercing cry give warning of danger. About the

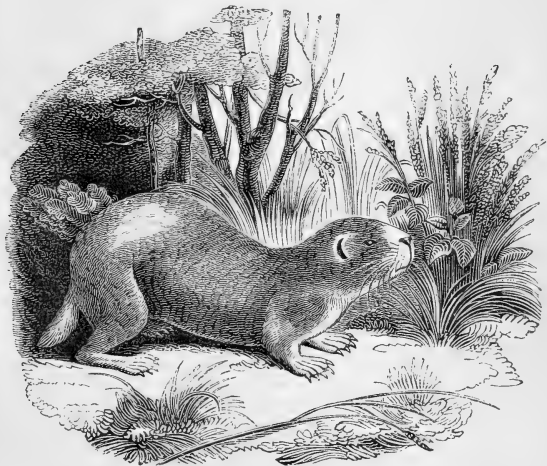
middle of September they betake themselves to their winter dormitories, and close the entrance with earth and the dried grass which they have accumulated: here they sink into a profound repose, from which they do not awaken till the return of April. Though timid and inoffensive, these animals defend themselves resolutely when driven to an extremity, and their powerful incisors inflict severe wounds. They lift their food to their mouths while sitting squirrel-like, and will walk on their hind feet. On retiring for the winter they are at first very fat, and numbers are taken at this season, partly for the sake of their skins, and partly for their flesh, which is eaten by the mountaineers. The young are easily



8.—Alpine Marmot.

tamed, and are often carried about by Savoyards for the purpose of exhibition. The marmot produces from three to five at a birth.

This species is of about the size of a rabbit. Its general colour is yellowish-gray, passing into hoary about the cheeks, and blackish-gray on the top of the head; the tip of the tail is black. (Fig. 8.)



9.—Bobac.

THE BOBAC (*Arctomys bobac*).

This species inhabits the regions of Poland through which flow the Dnieper and its tributary streams, whence it ranges through a great part of Northern Asia. It gives preference to hills of moderate elevation, where it chooses a dry locality in which to construct its burrows. These are carried to a great depth, and are tenanted by families consisting of twenty or even forty individuals.

It accumulates in its retreat a quantity of dried herbage for use, before the severity of the season commences, and for early spring consumption, as well as for the sake of warmth. General colour of the fur grayish-yellow mingled with brown, which latter forms transverse undulations on the upper parts. Under parts rust-brown. Length of head and body sixteen or seventeen inches; of the tail six inches. (Fig. 9.)

THE QUEBEC MARMOT (*Arctomys empetra*).

This species is one of the American marmots, and is a native of Canada and the neighbourhood of Hudson's Bay. It is the Quebec Marmot of Pennant and Godman; the Common Marmot of Langsdorff; the Thickwood Badger of the Hudson's Bay residents; the Siffleur of the French Canadians, who apply the same name to the other species of marmot and to the badger; Tarbagan of the Russian residents on Kodiak (?); Weenusk of the Crees; Kath-hillæ-Kogay of the Chepewyans; *Mus Empetra* of Pallas; and *Arctomys Empetra* of Sabine and others.

Dr. Richardson, who gives the above synonyms, states that the Quebec marmot inhabits the woody districts from Canada to lat. 61°, and perhaps still farther north.



10.—Quebec Marmot.

He says that it appears to be a solitary animal, inhabits burrows in the earth, but ascends bushes and trees, probably in search of buds and other vegetable productions on which it feeds. (Fig. 10.) Mr. Drummond killed two, one on some low bushes, and the other on the branch of a tree. According to Mr. Graham it burrows perpendicularly, selecting dry spots, at some distance from the coast, and feeding on the coarse grass which gathers on the river sides. The Indians capture it by pouring water into its holes. Its flesh is considered delicate when the animal is fat, but its fur is valueless.

DORMICE (*Myoxidæ*).

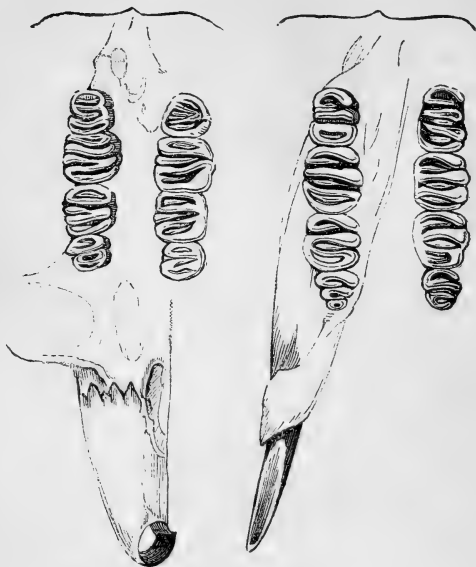
The dormice seem to connect the squirrels, on the one hand, to the murine groups on the other. They are arboreal in their habits, and clothed with fine soft fur. The toes are four on each fore foot, with the vestige of a fifth; the hind feet have five toes. The dentition (Fig.

12) is as follows:—Incisors, $\frac{2}{2}$; molars, $\frac{4-4}{4-4}$. Incisors laterally compressed; molars unequal in size, rooted; the series on each side of each jaw widely separated and parallel.

THE COMMON DORMOUSE (*Myoxus avellanarius*).

This elegant little creature is the Muscardin, Croque Noix, and Rat d'Or of the French; Moscadino of the Italians; Liron of the Spanish; Rothe Wald-maus, Hasel-maus, and Hasel-schläfer of the Germans; Skogsmus of the Swedes; Kassel-muus of the Danes; and Pathew of the ancient British. It has been supposed by some that it was this species which the Romans fattened in their Gliraria for the table: but that animal was most probably the loir (*M. Glis*), which is common in the woods of Italy, and which approaches a squirrel in size.

Though common in the southern and midland counties of England, the dormouse is not so abundant in France



12.—Teeth of Dormouse.

as the lerot (*M. nitela*, Fig. 15), yet its distribution is very extensive. It ranges from the south of Europe as far north as Sweden. The favourite resorts of this little animal are dense thickets, low woods and coppices of hazel, bushy dells, and tangled hedgerows. It creeps about the branches with a quick but gliding sort of movement, and with singular facility. It leaps nimbly, and makes its way so quickly through intertangled brushwood, that it cannot be easily captured. (Fig. 13.) The dormouse appears to be in some degree gregarious, or at least to colonize favourite spots, and ten or a dozen of their nests have been seen at no great distance apart in



13.—Common Dormouse.

the shrubs of a thicket. These nests are made of leaves, grass, &c. : they are of a rounded form, about six inches in diameter, with the aperture at the top. It is in these that the young are brought forth and reared. The number of the young is about four : they are born blind : in a few days, however, their eyes are opened ; and in a short period they are capable of providing for themselves. Corn, haws, hazel-nuts, and fallen acorns constitute the food of the dormouse. It eats sitting up like a squirrel, holding the food between its paws ; and often it hangs suspended by its hinder feet, in which position it feeds as easily as in its ordinary attitude.

Mr. Bell states that the name *Avellanarius* is not well

chosen, and that he never saw any dormouse that could gnaw through the shell of that nut when fully ripe. We ourselves, however, have frequently seen the dormouse open with its teeth the hard shell of a nut, and clear it out with great address. The dormouse hibernates, and hoards up a store of provision in holes, and the crevices about the roots of trees, &c., to which to have recourse in the winter; for its torpidity is not without interruption. A midday gleam of sunshine rouses it up in its snug retreat, and invites it forth, when it takes a little food; on the diminution of the temperature it betakes itself to its dormitory, and, rolling up itself into a ball, sinks into a profound slumber. In this condition it may be handled, or rolled about a table, if not exposed to the influence of warmth, without being roused from its trance. It is not until the spring has fairly set in that



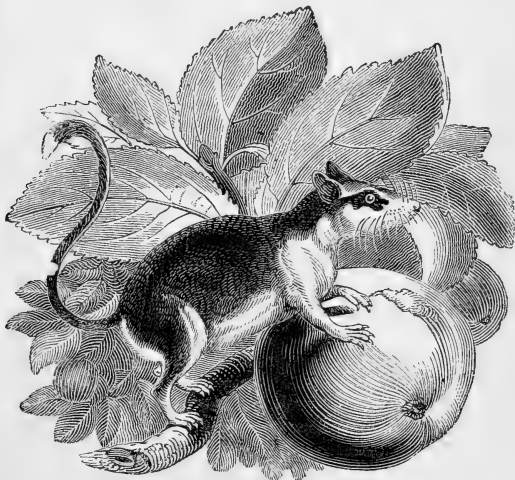
14.—Common Dormouse.

the dormouse regains its full activity, and it is at this period that its magazine is of the greatest service: for, without a store thus providently accumulated, it would, for some time at least, be straightened for food.

The head of this species is proportionably large; the eyes are large, black, and prominent; the ears are broad; the fur soft; the tail long, fringed with hair on each side, and somewhat tufted at the end; the body plump; the limbs short. General colour cinnamon red, passing into pale yellow below. The young are of a mouse-gray. Length of the head and body two inches eight lines; of the tail, two inches six lines. (Fig. 14.)

THE GARDEN DORMOUSE, OR LEROT
(*Myoxus Nitela*).

The greater Dormouse of Shaw. This species is a native of the whole of the temperate portions of conti-



15.—Lerot, or Garden Dormouse.

nental Europe, and indeed it is found as high north as Poland and Prussia. In France it is very common, gardens and orchards being its favourite abode; it makes sad havoc among wall-fruits, attacking peaches, apricots, pears, &c. with great avidity. (Fig. 15.) Its winter store, however, consists of nuts, peas, beans, and the like, which are collected in great abundance, and stowed away in some convenient recess, where eight or ten individuals assemble to pass away the colder season in sleep. The summer nest of the lerot, in which it rears its young, is built in the holes of walls or the chinks of aged trees. The young are four or five in number. The colour of this pretty but annoying creature is reddish gray; beneath, white; a black patch surrounds the eye, and spreads behind the ear. The tail is covered with short black hair, except at the end, which is tufted with white. Length of head and body four inches and a half; of the tail, four inches.

THE CAPE GRAPHIURE (*Graphiurus Capensis*).

The genus *Graphiurus* is scarcely to be separated from *Myoxus*; it is represented by the Cape Graphiure, a native of South Africa. This species is about the size of the lerot, which it much resembles in the style of its colouring, the general tint above being of a deep brownish gray; the muzzle and sides of the face reddish white; under parts grayish white, with a tinge of red; tail brown, the tip, which is not tufted, reddish white; a band of blackish brown extends from the eyes to the base of the ears. (Fig. 16.)

THE JERBOAS (*Dipus*).

The Jerboas constitute a group of the great murine section of Rodents, and termed by Mr. Waterhouse *Dipodidæ*, of which, he observes, the genera *Dipus*, *Alactaga*, and *Meriones* are examples.

All the animals of this tribe are remarkable for the shortness of the fore-limbs, the development of the hinder limbs, and the length and slenderness of the

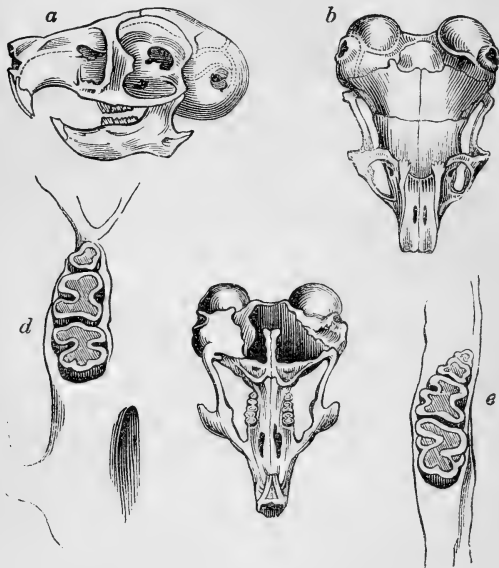


16.—Cape Graphiure.

metatarsus; they resemble in these points the kangaroos. They bound along on their hind limbs with great rapidity, and appear almost to skim, like birds, the flat plains or sandy wastes where they take up their abode. In an elaborate memoir by M. F. Cuvier on the Jerboas and Gerbilles, he divides these animals into different genera. The Jerboas (*Dipus*) have only three toes on the hinder feet, and these, as in birds, are articulated to a single elongated metatarsal bone, commonly known as the canon-bone. In the *Alactagas* there are five toes; of these the three central are articulated to a single metatarsal bone, while the other two have each their own slender metatarsal bone.

In *Meriones* and *Gerbillus* the toes are five, each with

their own distinct metatarsal bone. The incisors of the *Alactagas* are simple, whilst those in the upper jaw of the Jerboas are divided longitudinally by a furrow. The molars of the latter genus are complicated in form, and but little resemble those of the former. They are four in number in the upper jaw, and three in the



17.—Skull and Teeth of *Dipus hirtipes*.

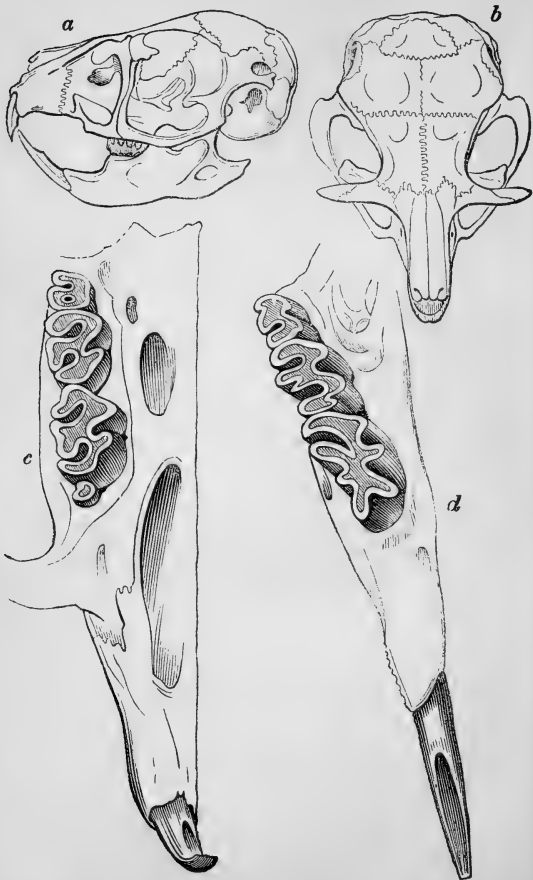
lower; but the first in the upper is a small rudimentary tooth, which probably disappears in aged individuals. After a detailed account of the structure of the grinding teeth, M. Cuvier observes that the general structure of the head of the *Alactagas* and Jerboas is

evidently the same, and is characterized by the large size of the cranium, the shortness of the muzzle, and, above all, by the magnitude of the suborbital foramina. The cranium of the Jerboa is distinguished by its great breadth posteriorly, resulting from the enormous development of the tympanic bone, which extends beyond the occipital posteriorly and laterally, as far as the zygomatic arch, which is by no means the case in the *Alactagas*, where all the osseous parts of the ear are of moderate dimensions. Another differential character between the two genera is presented by the maxillary arch, which circumscribes externally the suborbital foramina, and which in the *Alactagas* may be said to be linear, presenting a very limited surface for the attachment of muscles. He then notes a difference in the relative development of the jaws, the lower being comparatively much shorter in the *Alactagas* than in the Jerboas. Having described a new species of *Alactaga*, a native of Barbary, under the name of *Alactaga arundinis*, M. F. Cuvier proceeds to consider the characters and affinities of the genera *Gerbillus* and *Meriones*, and enters into a critical examination of all the species referred to those genera, and comes to the conclusion that they have a closer affinity with the true *Muridæ*, than with the Jerboas and *Alactagas*. Fig. 17 represents the skull and teeth of *Dipus hirtipes*: *a*, skull, profile; *b*, the same seen from above; *c*, the same seen from below; *d*, *e*, the teeth.

Fig. 18 represents the skull and teeth of *Alactaga*: *a* and *b*, the cranium, one-third larger than the natural size; *c* and *d*, the teeth, five times enlarged.

THE EGYPTIAN JERBOA (*Dipus Ægyptius*).

In the true Jerboas the head is large, and not unlike that of a rabbit in form; the ears are long and somewhat pointed; the eyes are full and prominent; the tail is very long, cylindrical, and covered with short hair, except at the extremity, which is tufted. The fur of the body is soft and delicate; the whiskers are long; the fore-feet are very small, and have four toes, and the

18.—Skull and Teeth of *Alactaga*.

rudiment of a thumb, furnished, however, with a nail. In the hind-feet of these animals we behold palpable evidences of their express adaptation to the deserts where they habitually reside. Not only is the metatarsal portion of the foot extremely elongated, but the toes are clad on the under surface with long bristly hairs, which, while they add to their span, and give firmness and security to their tread on a loose and yielding surface, defend the foot from the heat of a glowing waste beneath a fervid sun.



19.—Egyptian Jerboa.

The Egyptian Jerboa is found in Egypt, Barbary, Nubia, and the warmer parts of Syria and Arabia. It lives in troops, which colonize the most arid parts of the desert, where, on hillocks of sand or the crumbled heaps of ruins, they work out long burrows in which to dwell. In these burrows they make their nest and rear their young. So powerful are their teeth, that they not only gnaw in a short time through the hardest wood, but, a Sonnini affirms, through thin layers of stone beneath the sand. According to some, these animals are nocturnal

in their habits, stealing forth to feed and sport when evening begins to close. They are, however, not altogether nocturnal, for Sonnini observed them in broad day playing around the mouths of their subterranean habitations, and he particularly noticed that those which he kept delighted to bask in the sun, and were always lively in that situation. The Jerboas are very timid creatures and hasten to their burrows for security on the least noise: if intercepted, they trust to their speed, and seem to fly across the plain; so great indeed is the rapidity with which they bound along, that a greyhound has some difficulty in the chase. In making each leap they spring from the hind-feet, the impulse being given by the powerful muscles of the thighs, while the tail serves as a balance and rudder. (Fig. 19.) In the act of springing the fore-paws are pressed close to the chest; they descend, however, upon them, but such is the quickness of the leap, and the celerity with which they recover their due posture and spring again, that the eye is completely deceived, for it appears as if they never



20.—Egyptian Jerboa.

used the fore-paws at all, but alike sprang from and alighted on their long slender hind-legs alone. (Fig. 20.) When undisturbed, their common attitude is that of sitting upon the haunches; and the fore-paws are used in the same manner as in the squirrels and marmots. (Fig. 21.) The food of the Jerboa consists principally of bulbous roots which the animals dig up with the fore-paws; they also devour grain and other vegetable matters. It would appear that the Jerboa hybernates, but the duration of its torpor cannot be very protracted.



21.—Egyptian Jerboa.

The flesh of these animals, though unsavoury, is eaten by the Arabs and Egyptians, who contrive to capture them by stopping up all the openings of their subterranean retreat except one, which is netted.

Few animals, if we may judge from our own observations, bear confinement so impatiently as the Jerboas: they sedulously exclude themselves from observation, and when they come forth from their retreat in the evening, they are restless and distrustful in the extreme.

In size this species is equal to a large rat; the general colour is pale tawny yellow, passing into a lighter tint

beneath; the terminal tuft of the tail is black, merging at the tip into white; a white or whitish strip appears on each of the buttocks below the base of the tail.

THE DARK-BANDED JERBOA.

Of this Jerboa, which is figured by Shaw under the name of "the Jerboa," we have never seen an example. It is neither noticed nor figured by Lichtenstein, who has published the best monograph of these animals that has yet appeared. For ourselves we have no doubt but that the original figure was taken from a specimen of the Egyptian Jerboa, in which the abrupt border to the white mark was darker than usual; for in some instances the back is washed with a dusky tint, which has a tendency to assume wavy transverse bands, one of which, on the haunch, as it is said, is occasionally distinct. (Fig. 22.)

With regard to the *Alactagas*, to which we have alluded, the typical species, the Siberian *Alactaga* (*Dipus Jaculus*, Gmel.; the *Alactaga*, Buff.; the Siberian Jerboa, Pennant), is distributed from Arabia, through Persia, Tartary, and Turkey, and as far north as the Volga and Irtysh. It inhabits the plains and flat districts, where it makes extensive burrows; in general habits it resembles the common Jerboa of Egypt, but is of larger size.

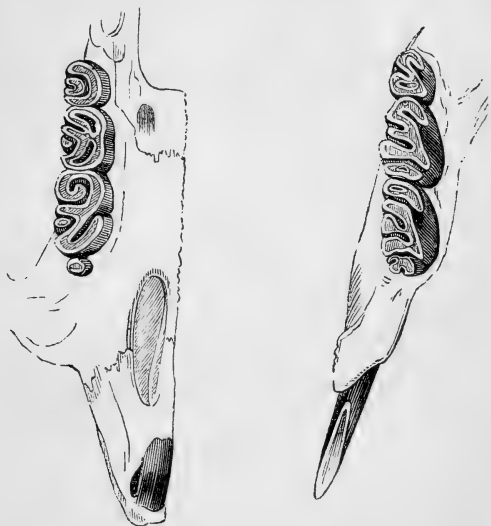
Its food is stated to consist not only of vegetable but also of animal substances, as small birds and insects; and, as we learn from Pallas, it spares not even its own species. The subterranean habitations of these animals are extremely capacious, and formed about half a yard below the surface of the ground. The passage leading to them is of great length, and pursues a circuitous course, having at intervals additional shafts or openings upwards, affording extra facilities for escape in the event of danger. During the winter they hibernate; retiring to their subterranean chambers, they shut up the openings, and sink into a complete state of lethargy. It is affirmed by Gmelin, that when their burrows are opened at this



22.—Dark-banded Jerboa.

season, a quantity of grain, dried shoots, and herbs are found within them; on the contrary, Pallas affirms that they collect no stores of provision for the winter. It is possible that both these naturalists, who had ample opportunities of investigating the habits of the *Alactaga* in a state of nature, may be correct, and that in the more northern districts of its range it may accumulate a store of provision, for use in the spring, when it first rouses from its torpidity. The *Alactaga* is more numerous and fertile in the warmer than in the colder latitudes; but it is nowhere to be seen in such numbers as the Egyptian Jerboa. From its large size and the superior flavour of its flesh, it is more sought after, as food, than that animal, and is chased, and also taken by stratagem, by the Arabs and Tartars. Such is its swiftness that it appears to skim the plain without touching the ground; even a

mounted horseman on a fleet steed can scarcely overtake it. The fur of the *Alactaga* is extremely soft and fine; on the upper parts it is of a pale fawn-yellow, clouded with grayish brown on the lower part of the back; a white crescentic line extends on each side of the crupper, below the root of the tail. The under parts of the body and inside of the limbs are white; the tail is brown, except the tuft at the extremity, which is black tipped with white.



24.—Teeth of Labrador Jumping Mouse.

THE LABRADOR JUMPING MOUSE

(*Meriones Labradoricus*).

This species appears to be the Labrador Rat of Pennant; the *Gerbillus Hudsonius* of Rafinesque; *Mus Labradorius* of Sabine; *Gerbillus Labradorius* of Harlan; the La-

brador Jumping Mouse of Godman; and Katse (the Leaper) of the Chepewyan Indians.

The genus *Meriones* in dental formula differs in some points from *Dipus*. The upper incisors, of a deep orange-colour, are marked with a longitudinal furrow; the molars are four on each side above, and three below; the first above is very small; the surfaces of the rest in both jaws are marked with irregular winding lines of enamel. (Fig. 24.) The muzzle is narrow and elongated; the ears rounded, the hind-limbs considerably developed; the tail long, ringed with scales, and thinly covered with short hair.

The Labrador Jumping Mouse, which was first described by Pennant in his 'Arctic Zoology,' is very



25.—Labrador Jumping Mouse.

common in the fur countries of North America, as far north as the Great Slave Lake, and perhaps farther; but of its habits we have no precise details. Its general colour is brownish-yellow, merging into white beneath. The length of the head and body is about five inches, that of the tail five and a half. (Fig. 25.) Dr. Richardson remarks respecting the jumping mice, of which there are, it would appear, several species, that those inhabiting different districts in America require to be compared with each other before the true number of species and their geographical distribution can be ascertained.



26.—Teeth of Cape Leaping Hare.

THE CAPE LEAPING HARE

(*Pedetes Capensis*, Ill.; *Helamys Capensis*, F. Cuvier; *Grande Gerboise*, Buffon; Spring Haas of the Dutch Colonists; *Cape Gerboa*, Pennant).

This curious animal, the only known example of the genus *Pedetes*, occupies an indeterminate situation among

the Rodents; but is most probably the most nearly related to the true Jerboas, which it resembles in external appearance. The molars are four on each side, in each jaw, of simple structure, with two laminæ; the incisors are large, strong, and broad. (Fig. 26.) The anterior limbs are short, but very strong, furnished with five toes armed with powerful claws. The hind-limbs are developed and muscular, four-toed, the toes armed with long



27. - Cape Leaping Hare.

pointed and somewhat hoof-like claws. Tail long. The leaping hare equals our common hare in size: the fur is soft, and of a dark fawn or brownish-yellow, passing into white beneath; the tail is hairy and tufted at the extremity with a pencil of black. The head is large, the ears are long and pointed, and the eyes full and dark. Native country, South Africa. (Fig. 27.)

The leaping hare is a burrowing animal, making its holes in the soft sandy ground, which it digs up with its fore-paws, spurring it backwards with its hind-feet, as is done by the rabbit. In these burrows it sojourns during the day, secure from the attacks of the various carnivorous animals which infest the precincts of its retreat. Night is the season of activity: it steals forth on the close of daylight to feed; and in some districts where it abounds the depredations which it commits in the fields of grain are very serious. It proceeds in the same manner as does the jerboa, by a series of bounds; and when the animal is pursued, each bound it makes clears a space of twenty or thirty feet. It eats sitting nearly upright, and using its fore-feet in the manner of a squirrel, to bring the food to the mouth. It also sleeps in the same attitude, excepting that the head is bent down between the hind-limbs, while the fore-paws cover the eyes and ears.

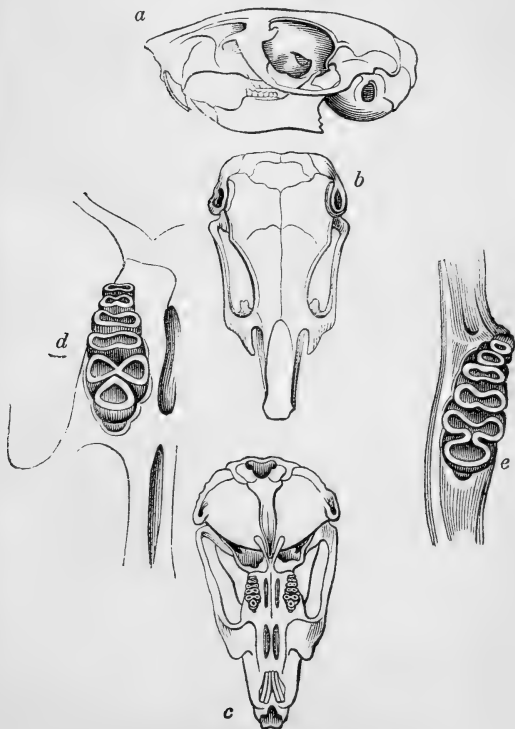
The leaping hare gives preference to the sides of steep and craggy mountains, and in some places they colonize a considerable extent of ground, making it a complete warren. Mr. Burchell, on his second journey to Asbestos Mountain, observed their burrows in abundance. Whether this animal lays up a store of winter provision, or whether it hybernates during a part of the year, does not appear to be ascertained; but it is very certain that, in the localities it frequents, it is not only subject to a low temperature during the cold season, but that it will also experience a scarcity of its usual food.

The voice of the leaping hare is a kind of inarticulate grunt.

The Caffres esteem these creatures for food, and expel them from their burrows by pouring water into the entrances, when they issue forth and are easily taken.

BURTON'S GERBILLE (*Gerbillus Burtoni*).

The *Gerbilles* belong to the family *Muridæ* (and not to that of the true jerboas). The contour of the skull and the characters of the teeth are confessedly murine (see Fig. 28: *a*, the skull, profile; *b*, the same seen



88.—Skull and Teeth of Burton's Gerbille.

from above ; *c*, the same seen from below ; *d*, *e*, teeth of the same). Though the gerbilles have the posterior limbs developed, their development is by no means to the same extent as in the jerboas ; and there is a far more equal proportion between them and the anterior pair ; hence these animals run as well as leap. They are active, elegant little creatures, living in burrows, which they excavate to a considerable depth, and are nocturnal in their habits. F. Cuvier enumerates eight species, respectively natives of Egypt, and other parts of Africa, and India. The species figured (Fig. 29) has been recently described by F. Cuvier (see 'Trans. Zool. Soc.' vol. ii.). Of its peculiar habits we know nothing definite, but they in all probability agree with those of the Indian gerbille, so well described by



29.—Burton's Gerbille.

General Hardwicke in the eighth volume of the 'Linn. Trans.' The Indian gerbille is common in Hindustan, and seems to be gregarious, great numbers associating together. "These animals are very abundant about cultivated lands, and are particularly destructive to wheat and barley crops, of which they lay up considerable hoards in spacious burrows near the scenes of their plunder. They cut the culms of the ripening corn just below the ears, and convey them thus entire to one common subterraneous repository, which when filled they carefully close, and do not open for use till supplies abroad become distant and scarce. Grain of all kinds is their favourite food, but in default of this they have recourse to the roots of grass and other vegetables. About the close of day they issue from their burrows, and traverse the plains in all directions to a considerable distance; they run very fast, but oftener leap, making bounds of four or five yards at a time, carrying the tail extended in a horizontal direction. When eating, they sit on their hind-legs like a squirrel, holding the food between their fore-feet. They never appear by day, neither do they commit depredations within-doors. I have observed their manners by night, in moonlight nights, taking my station on a plain, and remaining for some time with as little motion as possible. I was soon surrounded by hundreds at the distance of a few yards, but on rising from my seat the whole disappeared in an instant, nor did they venture forth again for ten minutes after, and then with much caution and circumspection.

"A low tribe of Hindoos called Kunjers, whose occupation is hunting, go in quest of these animals at proper seasons to plunder their hoards of grain; and often within the space of twenty yards find as much corn in the ear as could be crammed into a common bushel. They inhabit dry situations, and are often found at the distance of some miles out of the reach of water to drink. In confinement this animal soon becomes reconciled to its situation, and docile: sleeps much in the day, but when awake feeds freely at night. The Hindoos above mentioned esteem them good and nutritious food."

The Indian Gerbille is of the size of a common rat;

its eyes are full and black ; the ears are large, rounded, and almost naked. The general fur is bright bay, variegated on the back with pencil-like strokes of dark brown ; the under parts are white ; the tail is cylindrical, thickly covered with short hair, except at the tip, which is somewhat tufted, and of a dark brown.

MITCHELL'S GERBOA.

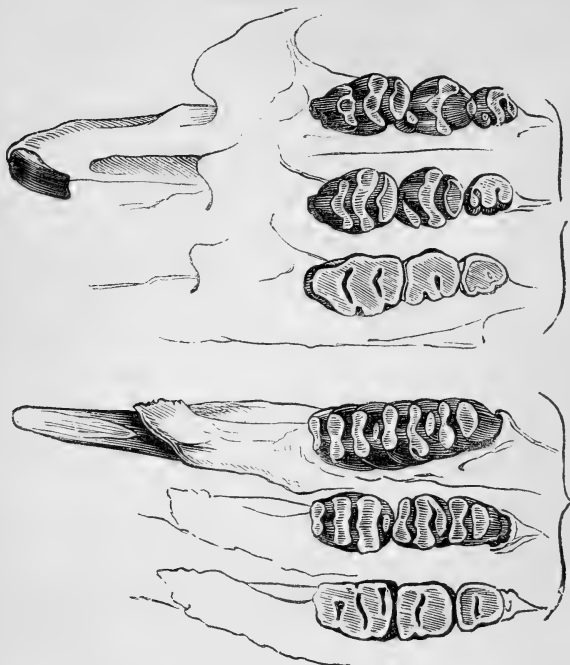
This animal, a native of Australia, and described by Mr. Ogilby under the name of *Dipus Mitchellii* (' Linn.



Trans.,' vol. xviii.), belongs, as we have every reason to believe, to the genus *Hapalotis* (Lichtenst., 'Säugt.' pt. vi., 1829). It seems to take the place, on the open plains of Australia, of the jerboas and gerbilles of the deserts and plains of Africa and Asia; or of the jumping mice of North America. This singular species was found on the reedy plains near the junction of the Murray and Murrumbidgee, on the northern boundaries of Australia Felix. The cut is taken from the figure in Sir T. Mitchell's account of 'Three Expeditions into the Interior of Eastern Australia.' (Fig. 30.) Sir T. Mitchell states that the fore and hind legs of this animal resembled in proportion those of a kangaroo; and it used the latter by leaping on its hind-quarters in the same manner. It was not much larger than a common field-mouse, but the tail was longer in proportion than even that of a kangaroo, and terminated in a hairy brush about two inches long. We may here remark that the genus *Hapalotis* is the same as *Conilurus*, Ogilby ('Linn. Trans.,' xviii., pt. i., p. 124, 1838), and must be retained, according to the law of priority.

THE COMMON MOUSE (*Mus musculus*).

The genus *Mus*, which includes the true rats and mice, is typical of the extensive family *Muridæ*. The characters of this genus may be thus summed up: incisors of the usual number; those of the lower jaw compressed and pointed; molars on each side, both above and below, three, with true roots, and a transversely tuberculated surface, the ridges varying in number in each tooth; the anterior molar is the largest, the posterior the smallest. (Fig. 31.) The muzzle is elongated and sharp; the ears are oblong or rounded, and almost naked. The toes of the anterior feet are four, with the minute rudiment of a thumb; those of the hind-feet are five. The limbs are short; the tail is long, cylindrical, tapering, and annulated with scales of epidermis, from between which emerge short hairs, forming a scanty covering. The fur is soft, but traversed by long outer hairs of a



31.—Teeth of Common Mouse.

stiffer quality than those composing the under-coat. All these animals are of small size, yet many are among the greatest pests to man. Although vegetable aliment, as grain, peas, &c., forms their principal food, still to a certain extent they are carnivorous. We know the partiality of the mouse to cheese, butter, lard, tallow, &c., and of the brown rat to raw flesh. The stronger and larger species often prey upon the smaller, and in times of scarcity they will attack and devour each

other. All are nocturnal, and most, if not all, subterranean in their habits, and also gregarious. Some frequent the fields and woods, some the gardens, and some the abodes of man, undermining floors and walls, and breeding within the precincts of his habitation. They are spread through every quarter of the globe; and the common mouse and the brown rat have been introduced by the indirect agency of man, even into the remotest and most desolate islands. (See 'Zoology of the Voyage of H.M.S. Beagle—Mammalia,' No. ii. of pt. ii., p. 31, et seq.) With respect to the brown rat (*Mus decumanus*), sometimes erroneously called the Norway rat, it appears to have been originally transported from Persia or India into Europe; its place was previously occupied by the black rat (*Mus rattus*), a smaller and more timid animal, and in some districts now quite extirpated by its more powerful rival. The brown rat was not known in England before 1730, nor in France before 1750. According to Pallas, it did not appear in Russia and Siberia till 1766; and Dr. Harlan states that it did not make its appearance in North America till 1775. When Dr. Richardson wrote his 'Fauna Boreali-Americana,' it was common in Lower Canada, but had not advanced much beyond Kingston in Upper Canada. He did not observe it in the fur countries, and believes, if it exists there, that it is only at the mouth of the Columbia river or at the factories on the shores of Hudson's Bay. Mr. Darwin found it at Buenos Ayres, Valparaiso, East Falkland Island, and Keeling Island. With respect to the black rat, even that is in all probability of foreign origin. It was not known in Western Europe before the middle of the sixteenth century, and Gesner was the first who described and figured it.

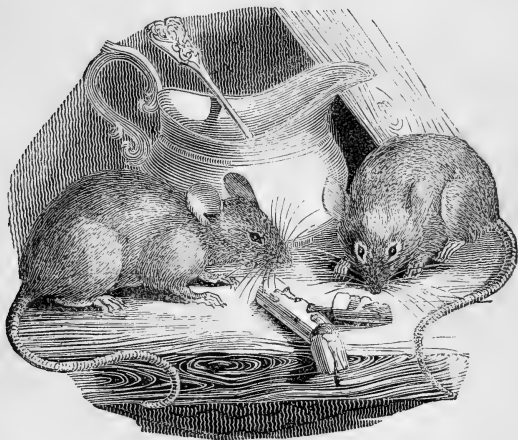
In the Island of Ascension, in the Atlantic Ocean, Mr. Darwin found two varieties, as he and Mr. Waterhouse consider, of the black rat (*Mus rattus*). These two animals differ in the colour of the fur, one being of a grizzled brownish colour, the other black, with more soft or glossy fur. "The specimen which has a black and glossy fur frequents the short coarse grass near the

summit of the island, where the common mouse likewise occurs. It is often seen running about by day, and was found in numbers when the island was first colonized by the English a few years since. The other and browner coloured variety lives in the outhouses near the sea-beach, and feeds chiefly on the offal of the turtles slaughtered for the daily food of the inhabitants. If the settlement were destroyed, I feel no doubt that this latter variety would be compelled to migrate from the coast. Did it originally descend from the summit? and, in the case first supposed, would it retreat there? and if so, would its black colour return? It must, however, be observed that the two localities are separated from each other by a space, some miles in width, of bare lava and ashes. Does the summit of Ascension, an island so immensely remote from any continent, and the summit itself surrounded by a broad fringe of desert volcanic soil, possess a small quadruped peculiar to itself? or more probably, has this new species been brought by some ship from some unknown quarter of the world? Or, I am again tempted to ask, as I did in the case of the Galapagos rat, has the common English species been changed by its new habitation into a strongly marked variety?—D.” (‘Zool. of Voyage of Beagle,’ p. 36.)

This zoological problem is one of the many so difficult to solve. Mr. Waterhouse remarks, “It appears as if the brown and black rats (*M. decumanus* and *M. rattus*), and likewise the common mouse, all of which follow man in his peregrinations, and which to a certain degree are dependent upon man, and may therefore be termed semi-domestic animals, are, like really domestic animals, subject to a greater degree of variation than those species which hold themselves aloof from him.” (Ibid.)

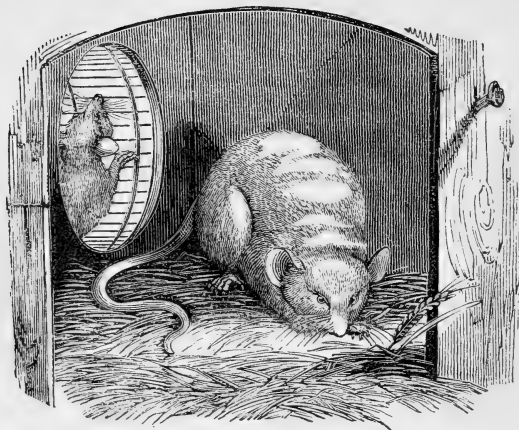
The common mouse is undoubtedly indigenous in Europe; and has been known from the earliest times: it is the Anglo-Saxon *Mus*, the German *Maus*, the Danish *Muys*, the Latin *Mus*, and the Greek *Mūs*. In Spanish its name is *Rat*; in Portuguese, *Ratinho*; in Italian it is called *Sorice*; and in French, *Souris*: from the Latin *sorex*, employed by zoologists to designate the Shrews.

This elegant but troublesome little animal needs no description ; all are well acquainted with it. (Fig. 32.) “ Domestic in its habits,” says Mr. Bell, “ nourished by almost every article of human food, and finding effectual shelter in the secret recesses of the habitations which human art has raised, it has accompanied man in all his adventures for colonization, and identified itself with every new territorial occupation of our race.” The mouse is easily tamed, and it is interesting to observe it



32.—Common Mouse.

sitting up holding its food between its paws, or cleansing with them the sides of its face and the back of its ears, its black eyes glistening with animation. An albino variety (white, with red eyes) is not uncommon (Fig. 33), and often kept in cages for the sake of its beauty. It breeds freely in captivity, perpetuating a white race, which, born and bred in captivity, are gentle and familiar,



33.—Common Mouse.

and when allowed to run about a room never attempt to escape.

The common mouse produces young to the number of five or six, several times during the course of the year. In about a fortnight they leave the mother, and obtain their living independently.

To this species Mr. Waterhouse (see 'Zool. of Beagle') refers six specimens in Mr. Darwin's collection: "Two were found living in the short grass near the summit of the island of Ascension, where the climate is temperate. Two others were procured on a small stony and arid island, near Porto Praya, the capital of St. Jago, in the Cape de Verde Islands, where the climate is very hot and dry. Excepting during the rainy season these little animals can never taste fresh water, nor does the island afford any succulent plant. A specimen was also procured on a grassy cliff on East Falkland island, at the distance of a mile from any habi-

tation. It is singular that so delicate an animal should be able to subsist under the cold and extremely humid climate of the Falkland Islands and on its unproductive soil."—*Darwin*. 'It must be observed that all these specimens are rather less than full grown individuals of the same species procured in England: in other respects they do not differ.

The sixth specimen is from Maldonado, where it is common in the houses of the town, and is similar in habits to its European relative. The Maldonado mouse is considerably less than British specimens of the common mouse, and is of a richer and brighter colour; the head is smaller, the muzzle shorter in proportion, whilst the tarsi are even longer than in a large specimen of *Mus musculus*. These points of dissimilarity induced Mr. Waterhouse to regard it as a distinct species, and to apply to it the name of "*brevirostris*." But upon subsequent re-examination, he was induced to change his opinion. The teeth indicate that it is not an adult specimen.

Mr. Darwin ('Journal and Remarks') observes that mice and other small Rodents subsist in considerable numbers in very desert places, as long as there is the least vegetation. In Patagonia, even on the borders of the Salinas, where a drop of fresh water can never be found, they swarm. Next to lizards, he adds, mice appear to be able to support existence on the smallest and driest portions of the earth, even on the islets in the midst of great oceans. He believes it will be found that several islands, which possess no other warm-blooded quadruped, have small Rodents peculiar to themselves. Sir Woodbine Parish ('Buenos Ayres,' &c.) states, that after the great drought of 1830, 1831, and 1832, there was a prodigious increase of all kinds of vermin, especially field-mice, myriads of which overran the country, and entirely destroyed the maize-harvest of 1833.

THE BARBARY MOUSE (*Mus Barbarus*).

In size this beautiful species is intermediate between the common mouse and rat. It is found in Barbary,



34.—Barbary Mouse.

where the natives term it Phār Azeph, the Palmetto mouse. Some time ago three individuals were living in the vivarium of the Zool. Soc., Lond.; and were described and figured by Mr. Bennett, who may be said to have really introduced this species to science: for, since the time of Linnæus, who first described the animal in the addenda to the twelfth edition (the last published by himself) of his ‘*Systema Naturæ*,’ no naturalist appears to have seen it. So completely, indeed, had it escaped the researches of later zoologists, that M. Desmarest ventured to suggest a doubt of its existence. (Fig. 34.)

“The ground-colour of the Barbary mouse is dark brown, marked on each side with five or six yellowish

stripes, about half as broad as the intervening spaces, extending along the whole length of the body, and becoming confused towards the under parts, which are nearly white. On the fore-feet only three of the toes are at first visible, and this circumstance, mentioned in the specific character given by Linnæus, has led many subsequent naturalists to doubt whether the Barbary mouse really belonged to the genus with which it was associated. Linnæus himself had, however, stated in his description of the species, that rudiments of a thumb, and also of a fifth toe, were observable on closer inspection; and this statement has been fully confirmed by an examination of the specimens in the Zool. Gardens” (‘Gardens and Menagerie delineated,’ p. 31).

Of the native habits and manners of the Barbary mouse we have no definite information. Those in confinement, to which we have alluded, resembled the rat in actions and disposition. Their carnivorous propensities indeed were amply evinced on the death of one of their number, by the two survivors having commenced devouring the body.

It may be observed that the specimens examined by Linnæus were very young, for he describes them as being smaller than the common mouse.

A beautiful striped mouse, termed the Cape striped mouse (*Mus pumilio*), is peculiar to the districts of the Cape of Good Hope. It was first described by Sparrman, who gives a figure of it in his ‘Travels in Africa,’ taken from a young individual. The general colour is brownish-gray, with four black stripes along the back; the upper surface of the head is black. Another species, the Indian striped mouse (*Mus striatus*), of which a few years since little was known, may also be noticed. Specimens of this animal have been kept alive in the vivarium of the Zool. Soc. The general colour is gray with a tinge of reddish or yellow, and the back is marked with a dozen longitudinal rows of small white spots distinct from each other, forming so many interrupted stripes; the under parts are whitish.

DARWIN'S MOUSE (*Mus Darwinii*).

Among the numerous small Rodents belonging to the family *Muridæ* collected by Mr. Darwin (see 'Zool. of H.M.S. Beagle'), is a small group, the species of which, Mr. Waterhouse observes, though very closely allied to the genus *Mus*, offer some slight modification not only in their external form, but also in the structure of the teeth.

"They have the fur soft and silky; the head large; and the fore-legs very small and delicate; the tarsus moderately long, and bare beneath. In the number and proportion of their toes they agree with the true rats; the tail is moderately long and more thickly clothed with hair than in the typical rats. The ears are large and clothed with hair. Like the true rats, they have twelve rooted molars; the folds of enamel, however, penetrate more deeply into the body of each tooth, and enter in such a way that the crowns of the teeth are divided into transverse and somewhat lozenge-shaped lobes of a triangular form. In the front molar of the upper jaw the enamel enters the body of the tooth twice, both in the outer and inner sides; and in the second and posterior molars, both of the upper and under jaws, the enamel penetrates but once externally and internally in each. In the front molar of the lower jaw the enamel enters the body of the tooth three times internally and twice externally" ('Proc. Zool. Soc.,' 1837, p. 27). These murine animals Mr. Waterhouse regards as constituting a subgenus, for which he proposes the name of *Phyllotis*. Darwin's mouse, *Mus (Phyllotis) Darwinii*, was found in dry and stony places at Coquimbo in Chile. The fur above consists of cinnamon-coloured and blackish hairs intermixed; the space before the eyes is of a grayish tint; the sides of the face and body are of a pale cinnamon colour. The under parts and limbs white; the ears are large; the tail as long as the head and body, brownish above, white beneath. Length of head and body six inches. (Fig. 35.)

Besides the subgenus *Phyllotis*, Mr. Waterhouse cha-

racterizes the following as subgeneric sections of the genus *Mus*, all peculiar to South America, and of which specimens were collected by C. Darwin, Esq., at various localities, viz., Coquimbo, Valparaiso, Port Desire, Maldonado, Bahia Blanca, &c.: *Scapteromys*, *Oxymycterus*, *Abrothrix*, *Calomys*, *Reithrodon*, and *Abrocoma*. ('Proc. Zool. Soc.' 1837.) The two latter, indeed, he considers as valid genera.



35.—Darwin's Mouse.

In North American there are two interesting genera of the *Muridæ*, which may here be noticed, namely, *Neotoma* and *Sigmodon*, both established by Say and Ord in the 'Journal of the Acad. Nat. Soc.,' Philadelphia. To the first genus belongs the Florida rat (*Neotoma Floridana*), larger than the ordinary rat, with soft velvety fur of a lead colour, with yellowish and black hairs intermixed. The specimen described by Say and Ord was discovered in a log granary situated in a ruined and deserted plantation in East Florida.

“When first aroused it ran a short distance, then returned, and stood close by us, allowing us to touch it with a gun before it again retreated. It was mild, or without that suspicious and cunning air so remarkable in the common brown rat. We have reason to think that the species is not uncommon in Florida, as several individuals were seen by Mr. Say, in an old mansion, but he was unprovided with the means of capturing them.” Specimens are preserved in the Museum of the Zool. Soc. A second species was discovered by Mr. Drummond in the Rocky Mountains, and is described by Dr. Richardson under the title of *N. Drummondii*. This animal “makes its nest in the crevices of high rocks, and seldom appears in the daytime. Its food most probably consists of herbage of various kinds, and of small branches of pine-trees, because there is generally a considerable store of those substances laid up in the vicinity of its residence. It is very destructive. In the course of a single night the fur-traders who have encamped in a place frequented by these animals have sustained much loss by their packs of furs being gnawed, the blankets cut in pieces, and many small articles carried entirely away. Mr. Drummond placed a stout pair of English shoes on the shelf of a rock, and as he thought in perfect security, but on his return after an absence of a few days he found them gnawed into fragments as fine as saw-dust.” This species is nine inches in the length of the head and body, its tail being seven inches and a half. Its general colour is yellowish brown above, and white beneath: the fur is full and soft, and the tail is bushy and densely hairy, instead of being round, tapering, and thinly covered with hair, as in the Florida rat. (Specimen in Museum of Zool. Soc.) With respect to the genus *Sigmodon*, the dentition of which is characterized by the flexures which the folds of enamel on the molar teeth present, one species only is described, viz., the rough-haired *Sigmodon* (*S. hispidum*). This animal is very numerous in the deserted plantations lying on the river St. John in East Florida, particularly in the gardens. Its burrows are seen in every direction.

Emigrants to that section of the country will find the species a great pest in rural economy. General colour, pale dirty ochre mixed with black; under surface ashy gray. Length of head and body, six inches; of the tail, four inches. (Specimen in Museum of Zool. Soc.) Closely allied to the genus *Neotoma* is a species termed the white-footed mouse (*Mus leucopus*), found in California, and on the borders of the Columbia river. The habits of this elegant little creature are well described by Dr. Richardson, who observed it as far north as the Great Bear Lake. "The gait and actions of this little animal are so much like those of the English domestic mouse, that most of the Europeans resident at Hudson's Bay have considered it to be the same species, altogether overlooking the obvious differences of their tails and other peculiarities. This American mouse, however, has a habit of making hoards of grain or little pieces of fat, which I believe is unknown of the European domestic mouse; and what is most singular, these hoards are not formed in the animals' retreats, but generally in a shoe left at the bedside, the pocket of a coat, a nightcap, a bag hung against the wall, or some similar place. It not unfrequently happened that we found barley, which had been brought from a distant apartment, and introduced into a drawer, through so small a chink, that it was impossible for the mouse to gain access to its store. The quantity laid up in a single night, nearly equalling the bulk of a mouse, renders it probable that several individuals unite their efforts to form it. This mouse does considerable mischief in gardens, and in a very few nights will almost destroy a plantation of maize, by tracing the rows for the purpose of collecting the seeds, and depositing them in small heaps under the loose mould, generally by the side of a stone or piece of wood. From the facility with which it seems to transport the substances it preys upon, I suspected that it had cheek-pouches, but none were found on examination. The Ermine is a most inveterate enemy to this species, and pursues it even into the sleeping apartments of houses." The colour above is fine dark brown; the under part

and feet are white. (Specimens in Museum of Zool. Soc.)

THE LONG-TAILED FIELD-MOUSE (*Mus sylvaticus*).

Eyes full, black, and bright;—colour above reddish brown, beneath whitish; ears more than half the length of the head; tail somewhat shorter than the head and body. Length of head and body three inches eight lines. It is Le Mulot of Buffon. (Fig. 36.)



36.—Long-tailed Field Mouse.

This beautiful but mischievous little animal is spread over the whole of temperate Europe. It frequents woods, plantations, parks, orchards, and gardens, where it commits great devastations. In some places it multiplies in hosts, and instances are on record of young plantations covering acres having been totally destroyed

by their depredations. They strip the bark and shoots from off the sapling trees, and root up the newly-planted acorns; nor are they less injurious in wheat-fields. Each individual lays up in its hole or burrow a winter store of food, consisting of grain, acorns, nuts, peas, &c.; and hence it is not only from what they devour at the time, but also from what they carry away that they cause such injuries. In the kitchen garden, as we can personally testify, they are not a little annoying, digging up peas and beans when newly sown or when beginning to germinate. One of their natural enemies, and one of the most efficient agents in their destruction, is the short-eared owl (*Otis Uhula*). Latham informs us that in certain districts which have been infested with these mice, the "owls have collected in large troops, and attacked the depredators, to their utter extermination." It is not exclusively to vegetable matters that these mice confine their diet; young birds become their prey, and when food is scarce they will attack each other, the younger or weaker falling victims to the more powerful.

The field mouse, though extremely timid, is easily tamed and rendered familiar, and its manners are very engaging. It is free from the unpleasant odour which renders the common mouse a nuisance. The field mouse breeds twice in the year, producing from six to ten young at a time. It is easy, therefore, to calculate the rapidity of its multiplication, and to account for the sudden appearance of swarms in spots where few had been previously observed. Buffon states that by means of a single trap two thousand three hundred were killed in twenty-three days, in a single field of about forty acres in extent. In some parts of our own country their numbers have been incalculable and their devastations frightful.

THE SHORT-TAILED FIELD MOUSE

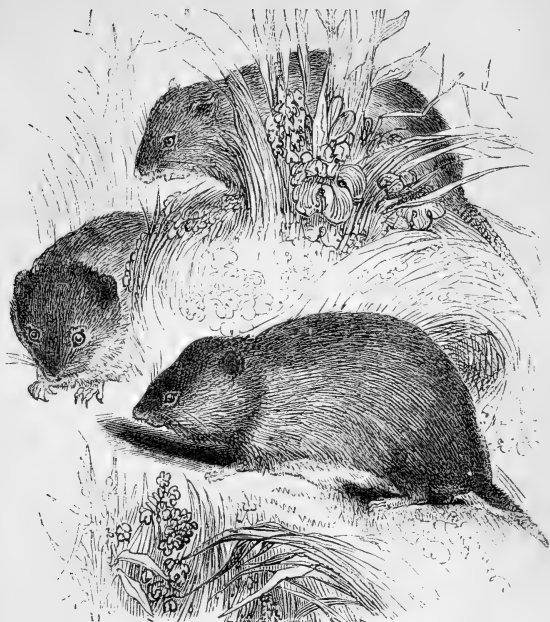
(*Arvicola agrestis*; *Campagnol*, Buffon; *Arvicola arvalis*, Selys-Longchamps).

The short-tailed field mouse (or Field-vole of Bell) is one of those Rodentia from which we often receive ex-

tensive injury, proving how necessary it is that, in order to keep their numbers within due bounds, an incessant warfare be maintained against them,—a warfare to which birds and beasts of prey are appointed.

This species is a native of the greater part of Europe, and is common in our island, where its depredations (and in France and in other parts of the Continent the same may be said) have rendered it notorious. It is exclusively a tenant of woods, plantations, corn-fields, and meadows; and not unfrequently appears in enormous multitudes. Often is the farmer disappointed of his crop of wheat, the newly-sown grain having been all rooted up and devoured by an army of these “wee cowerin’ creepin timorous beasties,” formidable not from their individual size, but their numbers. Whole plantations of young trees have in like manner been destroyed, the root of every sapling being eaten, or the bottom of the stem barked around. In the years 1813 and 1814 the ravages of these animals in the New Forest and the Forest of Dean were so great as to create an alarm lest the whole of the young trees in those extensive woods should be destroyed by them. In the first vol. of the ‘Zool. Journal’ is a letter from Lord Glenbervie to Sir Joseph Banks, entering into a detailed account of the devastations committed. Mr. Jesse, in his ‘Gleanings,’ referring to the plantations in these forests, says, that soon after their formation “a sudden and rapid increase of mice took place in them, which threatened the destruction of the whole of the young plants: vast numbers of these were killed, the mice having eaten through the roots of five-year-old oaks and chestnuts, generally just below the surface of the ground. Hollies also, which were five or six feet high, were barked round the bottom, and in some instances the mice had crawled up the tree and were seen feeding on the bark of the upper branches. In the reports made to government on the subject, it appeared that the roots had been eaten through wherever they obstructed the runs of the mice.”

Various plans were adopted for their destruction; and in holes dug purposely to entrap them, in the Dean



37.—Short-tailed Field Mice.

Forest alone 30,000 mice were caught in about three months, and a much greater number destroyed by stoats, weasels, kites, hawks, owls, crows, &c., and also by cats purposely turned out. In the New Forest about the same number were also destroyed, and it was calculated that the total destruction, including those caught in pits and traps, and those killed by other animals, and by their own species (for when their food fell short they attacked and devoured each other), amounted in the two forests to more than 200,000.

The field-vole measures four inches one line in the length of the head and body, and one inch three and a half lines in that of the tail. The fur is reddish brown above, gray beneath. (Fig. 37.) A distinct species, the Bank-vole (*Arvicola pratensis*, Baillon; *A. riparica*, Yarrell; *A. rufescens*, Selys-Longchamps) is found on the Continent, and in some parts of England. It is less than the former species, with a longer tail, and differs in several particulars in its internal anatomy.

THE HARVEST MOUSE (*Mus messorius*).

Of all our British mammalia the harvest mouse is the smallest. This beautiful little species was first discovered in our island by Gilbert White, and described in his 'Natural History of Selborne.' Yet it is by no means uncommon in the corn counties, and especially in Hampshire, though so long overlooked by British naturalists. It is found in Wiltshire, Gloucestershire, Devonshire, and Cambridgeshire, and occurs in France, Germany, Russia, and Siberia. It is the *Mulot nain* and *Rat de moissons* of F. Cuvier; the *Mus minutus* of Pallas, and the *Mus pendulinus* of Hermann.

The harvest mouse is a lively, active, playful little creature: its eyes are dark; its general colour above is delicate reddish-fawn; the under parts are abruptly white; the ears are short and rounded; the tail is rather shorter than the body. Length of head and body two inches six lines. (Fig. 38.)

This animal lives entirely in the fields, resorting in the winter to burrows of its own construction, or to corn-ricks, into which it penetrates, and there finds food and shelter. The asylum in which it rears its young is an artful and beautiful nest of a spherical figure, consisting of the split leaves and panicles of grasses artificially interwoven together, and suspended among the stalks of standing corn, on thistles, or other plants, to which it is secured, and of which the leaves will shroud it from notice. (Fig. 39.)

According to Dr. Gloger, the entrance to the nest is

rather below the middle, on the side opposite to the stems, and is scarcely observable; the parent closes it when she leaves the nest, and probably while she remains herself within. The inside is warm, smooth, and neatly rounded. One nest examined by Dr. Gloger contained five young, another nine.



38.—Harvest Mouse.

It would appear that the harvest mouse is insectivorous as well as granivorous, and this fact was first noticed by the Rev. W. Bingley, who obtained a female, which after its capture produced eight young, but being disturbed by a conveyance of several miles, she killed them, as the rabbit is frequently known to do. "One evening,"



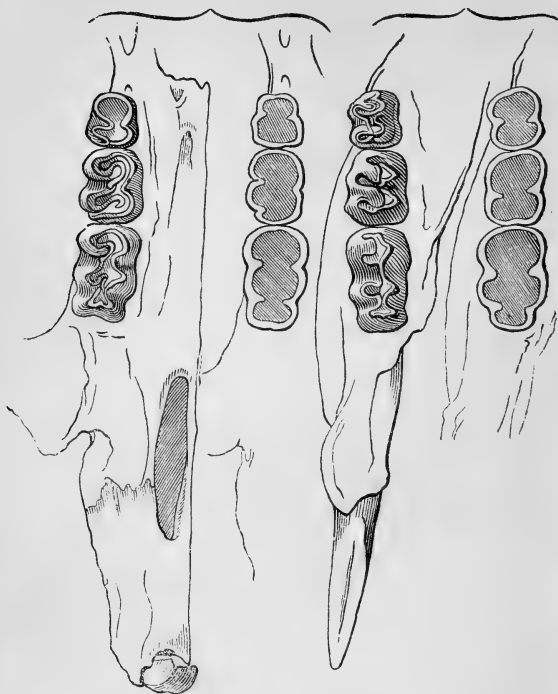
39,—Harvest Mouse.

he observes, "as I was sitting at my writing-desk, and the animal was playing about in the open part of its cage, a large blue fly happened to buzz against the wires; the little creature, although at twice or thrice the distance of her own length from it, sprang along the wires with the greatest agility, and would certainly have seized it had the space between the wires been sufficiently wide

to have admitted her teeth or paws to reach it. I was surprised at this occurrence, as I had been led to believe that the harvest mouse was merely a granivorous animal. I caught the fly, and made it buzz in my fingers against the wires. The mouse, though usually shy and timid, immediately came out of her hiding-place, and running to the spot, seized and devoured it. From this time I fed her with insects whenever I could get them, and she always preferred them to every other kind of food that I offered her." The same writer observed that the tip of the tail possessed a prehensile power, and that the animal used it while climbing about the wires of its cage. We have seen the harvest mouse in captivity tolerably tame, and reconciled to its prison. It often sits erect, and feeds itself, holding grain between its paws, which it also uses in dressing its soft fur. It drinks by lapping the water with its tongue, and sleeps rolled up into a ball.

THE HAMSTER (*Cricetus vulgaris*).

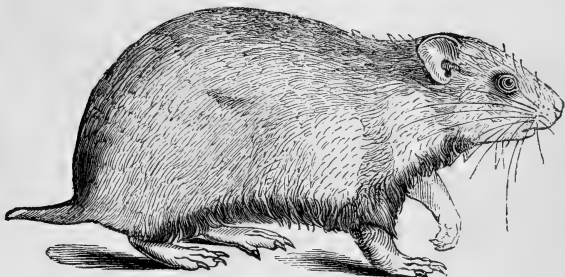
Fortunately for England the hamster is not indigenous within the precincts of the island. It inhabits the whole tract of countries extending between the Rhine and the Ural Mountains, and between the German Sea and Baltic to the north and the Danube to the south, wherever it finds a congenial soil. It is very common in Thuringia. Its proper soil is a deep alluvial mould with a substratum of clay; in dry, strong-soiled, or stony districts, it is not often found. The teeth of the hamster closely resemble those of the rat. (Fig. 40.) The tail is short and hairy. There are large cheek-pouches, as in some of the monkeys, in the form of sacs, which serve for carrying home food: they extend from the inside of the cheeks beneath the skin, along the sides of the neck, even over the shoulders. The general figure is thick: the limbs are short; there are four toes and a small thumb on the anterior feet; five toes on the hind-feet; the head is large, the muzzle abruptly pointed, the ears rounded. The general colour is as follows: head and upper parts reddish-gray, verging to yellow on the face;



40.—Teeth of Hamster.

under parts black, with the exception of the throat and feet, which are white. Three large distinct spots of white are also disposed on each side, one on the cheeks, one on the shoulder, and one on the ribs. Black varieties are not unfrequent: in these the nose and feet are white. There are two oblong spaces on the skin, situ-

ated one on each side of the spine, at a short distance in front of the thighs, which, instead of having the usual fur, are covered with short, brown, stiff hairs. These patches, which are about an inch long, are not always directly perceptible, being obscured by the surrounding long fur, which must be blown aside to show them. The adult male measures from nine to twelve inches, exclusive of the tail, which is about three inches long. The weight is sometimes more than a pound. The female is smaller by one-fourth. (Fig. 41.)



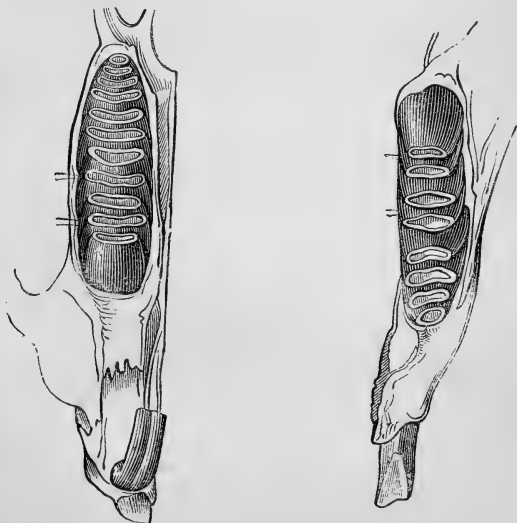
41.—Hamster.

The hamster is nocturnal in its habits: during the day it lies rolled up in its burrow; at night it issues forth to ramble in quest of food; after midnight it returns to its burrow and rests till about an hour before sunrise, when it takes a second ramble till the morning fairly dawns. Its movements are slow and creeping: it often utters short growling tones, but when irritated its voice is a shrill yelling cry. In collecting food, as beans, peas, wheat, &c., it uses its paws to press the grain backwards to the bottom of the pouches, in order to make room for the entrance of more. When these are well filled, it returns to its burrow to unload them, in which act it again uses its paws. In summer it feeds upon green fodder and the leaves of many plants; but the hamster

is also carnivorous, attacking and devouring rats, mice, birds, lizards, insects and their larvæ, and the weaker of their own species. Even the two sexes live in harmony only during the few days of each breeding-season. The hamster fights obstinately, and will jump with equal fury at a waggon-wheel or at a horse if he tread near it; and when two rival males meet, they engage in a desperate conflict till one retreats or perishes. In these paroxysms of fury the cheek-pouches become distended with air, the animal at the same time blowing and uttering at intervals its shrill cry.

In the construction of its burrows the hamster displays great ingenuity. They are in some respects modified according to age, sex, and soil; for each individual has its own exclusive burrow. Each burrow has at least two openings, one descends obliquely, the other perpendicularly. The former is termed the "creeping-hole," and this is excavated from without,—but the perpendicular passage, termed the "plunging-hole," is worked out from one of the chambers, that is, from within the subterranean domicile, and is often four feet deep. The distance of these two holes from each other varies from four to ten feet, and between the termination of these two passages are the chambers. The creeping-hole is not in such constant use as the other, and in an inhabited burrow it is regularly found stopped with earth at the distance of about a foot from the mouth. The chambers are more or less oval, and of large size: that nearest the creeping-hole is the smallest, and is well lined with a bed of soft fine straw: it has three openings, one into the creeping-passages, one into the plunging-passages, and one communicating with the store-chambers, of which there are several, at least in the burrows of the old male. Each chamber is filled in the autumn with provisions, and sixty-five pounds of corn or a hundredweight of horse-beans have been found in the magazines of a single hamster. The burrow of the female has from three or four to eight plunging-holes, all terminating in her nest-chamber. Here she produces her litter, from six to eighteen in number. The young are

born blind and naked, but in eight or nine days their eyes are opened : they grow rapidly, and in about a fortnight begin to dig small burrows, each making its own. The female has several litters in the course of the year. About the middle of October, the hamster retires for good to its retreat, stopping up first the creeping-holes, then the plunging-holes;—after this the animal keeps awake (though underground) for about two months, living on its store, and becoming very fat. When the cold of winter has fairly set in and reached it, it sinks into a complete state of torpor, which continues till the middle of February. About the middle of March it begins to open its passage and re-visits the fields : it now abandons its old burrow, and begins to form a new one. The flesh of the hamster is said to be very good ; the



42.—Teeth of Caffre Broad-eared Rat.

fur is also esteemed,—and the hamster-hunter, who trades in the skins, usually opens the burrows after the corn has been reaped, for the sake of obtaining the grain which the hamster has accumulated.

THE CAFFRE BROAD-EARED RAT

(*Euryotis unisulcatus*).

This species of rat is a native of South Africa, whence it was brought by M. Delalande. It forms the type of the genus *Euryotis* of Brands, to which title that of *Otomys*, proposed by F. Cuvier, must give place. Dr. A. Smith has appropriated the term *Otomys* to another group of Rodents. In its dentition (Fig. 42) this ani-



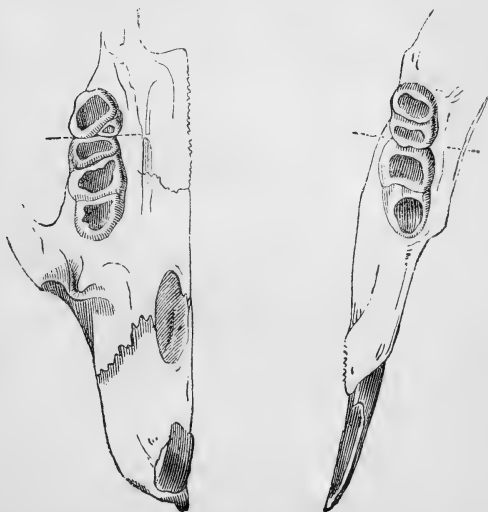
43.—Caffre Broad-eared Rat.

mal closely approximates to the true rats, as also in general form and structure: the eyes are large; the ears are ample and broad, and furnished with an internal projecting membrane, which when its edges are approximated entirely shuts the entrance of the auditory opening. The fur is thick and soft, and the general tone of colouring is a clouded yellow tint, becoming yellowish-white on the under parts. Length of head and body about six and a half inches; of tail, nearly three inches. (Fig. 43.) Of the habits and manners of this animal we have no definite information.

THE HYDROMYS

(*Hydromys leucogaster* and *chrysogaster*).

Though we refer the genus *Hydromys* to the *Muridæ*, it differs in dentition from the other members of that



44.—Teeth of Hydromys.



45.—Hydromys.

family. There are only two molars on each side above and below ; the first above is three times the size of the second, and is composed of three irregular portions, each portion being depressed in its centre, which is surrounded by a ridge of enamel ; the second molar is composed of two unequal parts : the first molar below is twice the size of the second, and both are composed of two parts. (Fig. 44.) The *Hydromys* is an aquatic animal, and well adapted for swimming : the head is flat ; the body otter-like, elongated, and covered with close glossy fur : on the fore-feet there are four toes and the rudiment of a thumb ; on the hind-feet there are five toes united by webs. The tail is long and cylindrical, covered with close stiff hairs ; the ears are short and rounded ; the upper surface is brown, the extremity of the tail for about a third of its length white ; the under surface varies from white to a fine deep orange-yellow. (Fig. 45.) Some writers have regarded these varieties

as distinct species ;—we have seen specimens with the colour of the under surface in intermediate stages between white and yellow. Length of head and body about twelve inches ; that of the tail nearly as much. The *Hydromys* is a native of Van Diemen's Land and various small islands in D'Entrecasteaux Channel ; but of its habits we have no detailed accounts.

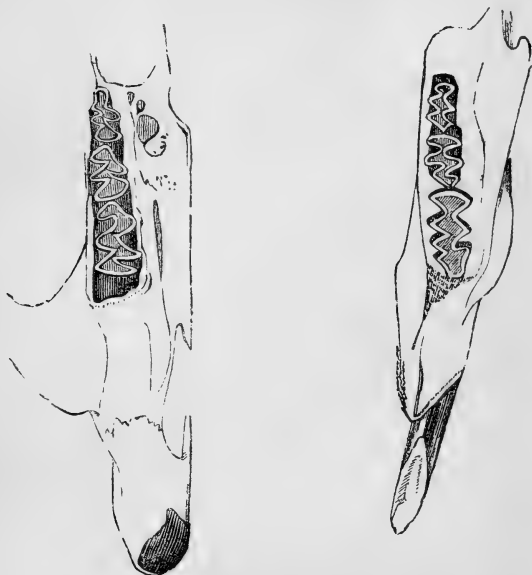
The family *Arvicolidæ*.—In this family are comprehended the Water-Rat, the Lemming, and other Rodents, termed Campagnols, Voles, &c., distinguished from the *Muridæ* by having rootless molars, by having the angle of the lower jaw raised, and by certain peculiarities in the structure of the cranium.

THE ECONOMIST MOUSE (*Arvicola œconomus*).

In the genus *Arvicola* the molars are $\frac{3-3}{3-3}$ composite

with flat crowns, presenting angular enamelled laminæ. (Fig. 46.) The ears are moderate, the muzzle obtuse, the tail shorter than the body, and hairy. The Economist mouse is a native of the northern sweep of Siberia, and Kamtchatka. It would appear that the same or a closely-allied species inhabits Iceland. It is a burrowing animal, and constructs beneath the turf narrow galleries which lead to a chamber, in the form of an oven, communicating with another used as a magazine, in which it stores up food for winter consumption. This consists of bulbous roots, and various grains and berries ; and the quantity of provision amassed is often very considerable. These animals breed several times in the year, producing three or four at a birth. Like the lemming, from some unknown cause, these mice, at irregular periods, but always in the spring, perform extensive migrations. Multitudes assemble together, forming an army myriads strong. In Kamtchatka their progress is westward ; neither rivers, nor lakes, nor even arms of the sea stop them ; thousands are drowned or destroyed by birds and beasts of prey,—but onwards the army marches,—pur-

suings their course, until they have crossed the river Penshim, when they bend their way towards Judoma and Ochot, which they usually reach about July: they return to Kamtchatka in October, but sadly reduced in numbers by the accidents of flood and field. According to Dr. Henderson the Economist mouse of Iceland dis-



46.—Teeth of Economist Mouse.

plays great sagacity in conveying home and stocking its provisions; and he corroborates the account of MM. Olafsen and Povelsen respecting their mode of conveying them across such streams as they may meet with in their foraging expeditions. "The party, which consists of



47.—Economist's Mice.

from six to ten, select a flat piece of dried cow-dung, on which they place the berries in a heap in the middle ; then by their united force they bring it to the water's edge, and, after launching it, embark and place themselves round the heap with their heads joined over it, and their backs to the water, their tails pendent in the stream serving the purpose of rudders." (Fig. 47.) The truth of this fact he says was confirmed by the testimony of two credible witnesses, the clergyman of Briâmsloek, and Madame Benedictson, of Stickesholm. He further states that they make a drainage from their burrow, leading into a deep hole, intended for the reception of the water.

THE WATER-RAT

(*Arvicola amphibia*; *Rat d'eau*, Buff.).

The water-rat is by many regarded as a variety of that destructive animal the common rat, which, as is well known, often takes up its quarters in drains and ditches, and the banks of canals, especially near houses, farms

stables, &c., making deep burrows in which to rear its young. From this pest the water-rat is totally distinct. It frequents the borders of large ponds, reservoirs, streams, and rivers, dwelling in burrows of considerable extent, to which there are generally two or more outlets. The main outlet is in most instances close to the water's edge, so that during floods it is not unfrequently below the surface, but the gallery, sloping upwards as it proceeds in the bank, terminates in a chamber which the water does not reach. Here, in a snug bed of dried grass and vegetable fibres, the female rears her young. Nocturnal or crepuscular in its habits, it is chiefly as the dusk of evening steals on that the water-rat emerges from its retreat, but it seldom ventures far from the margin of the pond or river, into which when alarmed it immediately plunges, and swims under the cover of overhanging roots and herbage to its burrow. Though not web-footed, it is at home in the water, and dives with great ease. There are few persons who have not noticed its waymarks on the surface of stagnant ponds or ditches mantled over with a thick crop of chickweed. These tracks are made during the night, the season in which it wanders in search of food or its fellows. The roots of aquatic plants, especially the typha, the stems of equisetum, buds and bark, &c., constitute the diet of this species: it has been affirmed that it feeds also upon insects, small fishes, frogs, &c., but for this assertion there is not the slightest foundation. It would appear that the water-rat hibernates during some portion of the winter, and also lays up a store of food. Mr. White says, "As a neighbour was lately ploughing in a dry chalky field, far removed from any water, he turned out a water-rat that was curiously laid up in an hybernaculum artificially formed of grass and leaves. At one end of the burrow lay above a gallon of potatoes regularly stowed, on which it was to have supported itself for the winter." It must be acknowledged that there are some points in the history of this species to be cleared up. In size this animal equals the common brown rat, but the head is thicker and more obtuse, the muzzle being blunt and short; the

ears are scarcely apparent, being buried in the fur; the eyes are small and black; the tail is little more than half the length of the body, and thinly covered with short hairs. The fur is thick and close; its colour on the upper parts is dark reddish-brown mixed with gray; on the under surface brownish-white: a black variety sometimes occurs. (Fig. 48.) The species is spread over most parts of Europe.



48.—Water-Rat.

THE BEAVER (*Castor Fiber*).

The Beaver is not exclusively confined to the northern portions of the American continent. Erman (see 'Journey round the Earth,' &c.) informs us that it "abounds in the Obi, and is taken, not for the sake of

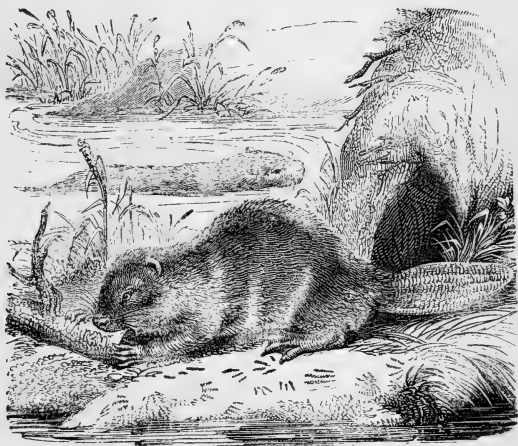
its fur, but for its musk, which bears a very high price." It is common along the Euphrates, and a skin sent home by Col. Chesney is in the possession of the Zool. Soc. Lond. The beaver occurs also along some of the larger rivers of Europe, as the Rhône, the Danube, the Weser, and the Nuthe, near its confluence with the Elbe. It was formerly an inhabitant of our own island, and Giraldus Cambrensis gives us a short account of their manners in Wales; but in his time (1188) they were only found in the river Teify. By the laws of Hoel-dda, the price of a beaver's skin was fixed at 120 pence, a great sum in those days. Whether the European, Asiatic, and American beavers are specifically identical or not, yet remains to be determined. Certain it is that the European beaver, as proved by the little colony in the Nuthe, displays the same manners and building propensities as its transatlantic brethren; and per contra, the thinly scattered beavers, near the settlements in America are solitary animals, dwelling in burrows like the scattered few along the Rhône, though it must be observed that one from the latter river in captivity exhibited as marked a constructive disposition as any American beaver under the same restrictions. The mode of building as conducted by the beaver of America is described by Hearne with great clearness and the absence of the ordinary exaggeration. The situation chosen is various: where the beavers are numerous, they tenant lakes, rivers, and creeks, especially the two latter, for the sake of the current, of which they avail themselves in the transportation of the materials. They also choose such parts as have a depth of water beyond the freezing-power to congeal at the bottom. In small rivers or creeks in which the water is liable to be drained off when the back-supplies are dried up by the frost, they are led by instinct to make a dam quite across the river, at a convenient distance from their houses, thus artificially procuring a deep body of water in which to build. The dam varies in shape: where the current is gentle, it is carried out straight; but where rapid it is bowed, presenting a convexity to the current. The materials used

are drift-wood, green willows, birch, and poplars, if they can be got, and also mud and stones; these are intermixed without order, the only aim being to carry out the work with a regular sweep, and to make the whole of equal strength. Old dams by frequent repairing become a solid bank, capable of resisting a great force of water and ice, and as the willows, poplars, and birches take root and shoot up, they form by degrees a sort of thick hedge-row, often of considerable height. Of the same materials the houses themselves are built, and in size proportionate to the number of their respective inhabitants, which seldom exceeds four old and six or eight young ones. The houses, however, are ruder in structure than the dam; the only aim being to have a dry place to lie upon, and perhaps feed in. When the houses are large, it often happens that they are divided by partitions into two or three or even more compartments, which have, in general, no communication, except by water; such may be called double or treble houses, rather than houses divided. Each compartment is inhabited by its own possessors, who know their own door, and have no connexion with their neighbours, more than a friendly intercourse, and joining with them in the necessary labour of building. So far are the beavers from driving stakes, as some have said, into the ground when building, that they lay most of the wood crosswise, and nearly horizontal, without any order than that of leaving a cavity in the middle; and when any unnecessary branches project inward, they cut them off with their chisel-like teeth, and throw them in among the rest to prevent the mud from falling in. With this wood is mixed mud and stones, and the whole compacted together. The bank affords them the mud, or the bottom of the creek, and they carry it, as well as the stones, under their throat by the aid of their fore-paws; the wood they drag along with their teeth. They always work in the night, and have been known during the course of a single night to have accumulated as much mud as amounted to some thousands of their little handfuls. Every fall they cover the outside of their houses with fresh mud, and as

late in the autumn as possible, even when the frost has set in, as by this means it soon becomes frozen as hard as stone, and prevents their most formidable enemy, the wolverene or glutton, from disturbing them during the winter. In laying on this coat of mud they do not use their broad flat tails, as has been asserted—a mistake which has arisen from their habit of giving a flap with the tail when plunging from the outside of the house into the water, and when they are startled, as well as at other times. The houses when complete have a dome-like figure, with walls several feet thick, and emerging from four to six feet above the water. The only entrance is deep under water, below a projection called the “angle” by the hunters, and beyond the reach of the frost: near this, also under water, is laid up their winter store, a mass of branches of willows and other trees, on the bark of which they feed. These they stack up, sinking each layer by means of mud and stones, and often accumulate more than a cartload of materials. Besides these winter-houses, in which they are shut up during the severities of the season, they have always a number of holes in the banks which serve them as places of retreat when any injury is offered to their houses, and in these they are generally taken. The entrance to these holes is deep below the water, which fills a great part of the vault itself. When the hunter forces the houses of the beaver in winter (the hunting season), the animals swim beneath the ice to these retreats, the entrances of which are discovered by striking the ice along the banks with an iron ice-chisel, the sound indicating to practised ears the exact spot: they cut a hole in the ice and surprise their booty. During the summer the beavers roam about at pleasure, and it is during this season that they fell the wood necessary for repairing their houses and dams, or for building others, commencing the latter about the end of August. Such is the strength and sharpness of their teeth, that they will lop off a branch as thick as a walking-stick at a single effort, and as cleanly as if cut with a pruning-knife. Larger stems they gnaw all round, taking care that their fall shall be towards or into the water.

They rapidly fell a tree the shaft of which is as thick or thicker than a man's thigh, or from six to ten inches in diameter; and places of more than three acres in front of the river and one in width have been seen with the timber all felled by these animals, though many of the trees were as thick as a man's body.

The beaver does not attain its full growth before three years, but it breeds before that time. It produces from two to six at a birth. The flesh of this animal is esteemed by the Canadian hunters, and by the natives, as



49.—Beaver.

a great delicacy, and we need not say how valuable its fur is as an article of commerce. It is from certain glandular sacs in the beaver that the substance called castor, or castoreum, used in medicine, is obtained, and which (procured from the European variety) was well known to the ancients.

In captivity the beaver soon becomes familiar and sociable, and, if permitted, will even in a room exercise itself in attempts to build, using brushes, baskets, boots, sticks, and in short anything it can get hold of for the purpose.

The fine fur of the beaver varies from glossy brown to black; the tail, or caudal paddle, used as a rudder in diving or in ascending, is flat, scaled, and oarlike. The length of the head and body of a full-grown animal is about forty inches; of the caudal paddle, one foot. The feet are all five-toed; those of the hind-feet are united by a broad palmated expansion; the nails are strong, and that of the second toe of the hind-feet consists of two portions. On land the gait of the beaver is awkward and shuffling, owing in part to the outward turnure of the hind-feet, which fits them for aquatic progression, and in part to the thick and clumsy configuration of the body. (Fig. 49.) The genus *Castor* is somewhat isolated, and may be regarded as the type of a subfamily.

THE MUSQUASH

(*Ondatra Zibethica*; *Fiber Zibethicus*, Sabine; *Musk-rat*, Godman; *Ondathra* of the Hurons; Musquash, Watsuss, or Wachusk, and also Peesquaw-Tupeyew ("the animal that sits on the ice in a round form") of the Cree Indians).*

The dentition of this animal (Fig. 50) presents a close affinity to that of the water-rat and other species of *Arvicola*, as in Fig. 46. Molars, $\frac{3-3}{3-3}$.

The musquash is a native of North America, and in its general form it resembles the common water-rat, size excepted. In the length of the head and body it measures about fourteen inches, that of the tail being eight or nine. The fur, which is much like that of the beaver, is dark umber brown passing into brownish yellow on the under parts: pied and even white varieties are sometimes seen. The hind-feet are not webbed; the tail is

compressed laterally, broadest in the middle and covered with a thin sleek coat of short hairs; longer hairs run along the acute margins. (Fig. 51.)

The range of this animal is from lat. 30° as high north as 69° . Small grassy lakes or swamps, or the grassy borders of slow streams, are its favourite haunts. Vegetable matters are its principal food, as roots, tender shoots, the leaves of various carices, &c.; to which it adds fresh-water mussels (*Unio*). The musquash swims and dives well, plunging into the water on the least



50.—Teeth of Musquash.

alarm, and diving instantaneously on perceiving the flash of a gun. This animal builds winter habitations, but far less solid and durable than those of the beaver. These habitations are thus described by Dr. Richardson:—"In the autumn, before the shallow lakes and swamps freeze over, the musquash builds its house of mud, giving it a conical form, and a sufficient base to raise the chamber above the water. The chosen spot is generally amongst



51.—Musquash.

long grass, which is incorporated with the walls of the house from the mud being deposited amongst it, but the animal does not appear to make any kind of composition or mortar by tempering the mud and grass together. There is, however, a dry bed of grass deposited in the chamber. The entrance is under water. When ice forms over the surface of the swamp, the musquash makes breathing-holes through it, and protects them from the frost by a covering of mud. In severe winters, however, these holes freeze up in spite of their coverings, and many of the animals die. It is to be remarked that the small grassy lakes selected by the musquash for its residence are never so firmly frozen nor covered with such thick ice as deeper and clearer water. The Indians kill these animals by spearing them through the walls of their houses, making their approach with great caution,

for the musquashes take to the water when alarmed by a sound on the ice. An experienced hunter is so well acquainted with the direction of the chamber and the position in which its inmates lie, that he can transfix four or five at a time. As soon as, from the motion of the spear, it is evident that the animal is struck, the house is broken down, and it is taken out. The principal seasons for taking the musquash are the autumn, before the snow falls, and the spring, after it has disappeared but while the ice is still entire. In the winter time the depth of snow prevents the houses and breathing-holes from being seen. One of the first operations of the hunter is to stop all the holes with the exception of one, at which he stations himself to spear the animals that have escaped being struck in their houses and come hither to breathe. In the summer the musquash burrows in the banks of the lakes, making branched canals many yards in extent, and forming its nest in a chamber at the extremity, in which the young are brought forth. When its house is attacked in the autumn, it retreats to these passages, but in the spring they are frozen up. The musquash may be frequently seen on the shores of small muddy islands, sitting in a rounded form, and not easily to be distinguished from a piece of earth, until, on the approach of danger, it suddenly plunges into the water. In the act of diving, when surprised, it gives a smart blow to the water with its tail. Its flesh is eaten by the natives, though it has a strong musky flavour. The fur is used for hat-making, and between four and five hundred thousand skins are annually imported into Great Britain. The musquash breeds three times in the year, producing from three to seven at a birth.

THE MOLE-RAT

(*Aspalomys Typhlus*, Laxmann; *Spalax typhlus*, Guldentst.; *Aspalax typhlus*, Desm.; Zemni, Rzaczinski; Slepéz, Gmelin; Podolian Marmot, Pennant).

This strange animal (which forms the type of a distinct family) is expressly organized as a miner. The

body is mole-shaped and covered with close fur, the limbs are short and thick, with strong short claws. The head is broad and flat, with a lateral margin or ridge running from the great naked nose to the ears, and indicated by a line of white stiff hairs. Breadth of head across, $2\frac{5}{8}$ inches; length the same. Total length eleven inches. Tail wanting. Teeth white: general colour pale sandy ash-gray; the hairs pale lead-colour at the base. The specimen from which these notes were made (in the Paris Museum) was brought from Russia ("le pays des Cosaques du Donn"): a second specimen, from Syria, was smaller; eight and a half inches long, with bright orange teeth, and the lateral ridge of the head not fringed with white hairs; its colour also was darker. (Fig. 52.)



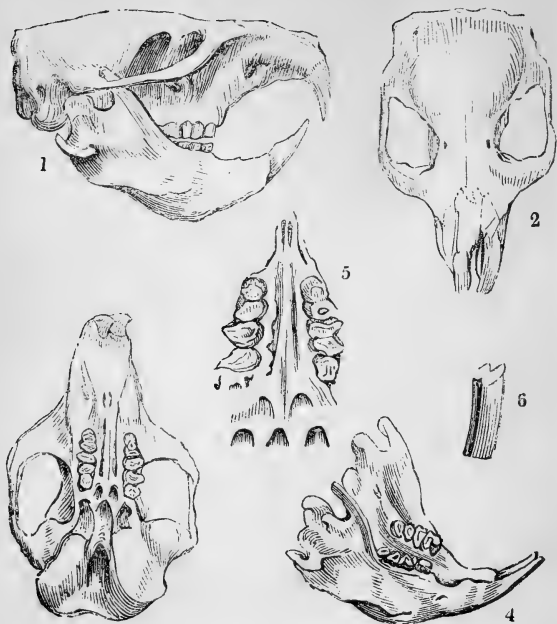
52.—Mole-Rat.

The mole-rat is a native of Asia Minor, Syria, Mesopotamia, and Southern Russia between the Tanais and Volga. The Russians term it *Slepez*, or the blind; and the Cossacks, *Sfochor Nomon*, which has the same meaning. It is generally supposed to be the ἀσπάλαξ (*Aspalax*) of Aristotle; but as a species of mole inhabiting Europe (*Talpa cæca*) has the eyes also rudimentary, this point is doubtful. In the mole-rat the eye is a minute black grain lying beneath the skin, which passes over it, and is besides covered with the fur; it is evident that the sense of vision is denied to this creature; but by way of amends its internal organs of hearing are largely developed, and the external orifice is wide, though the conch of the ear is almost obsolete. The mouth is small; the tip of the nose is largely bare and cartilaginous, with the nostrils wide apart and placed below. The mole-rat has much of the manners of our common mole: it is gregarious, and its burrows are clustered together. Rich level plains are its favourite localities. Its burrows consist of galleries at a little distance below the surface of the earth, which communicate with chambers sunk to a greater depth. From its galleries it drives lateral passages in search of roots, particularly of the bulbous *Chærophyllum*, on which it feeds. According to Rzaczinski, it also devours grain, of which it amasses a store in its burrow for winter consumption. Its actions are sudden and quick, but irregular; and it moves along with equal ease both forwards and backwards. It burrows very expeditiously. In the morning it often quits its retreat and basks with its mate in the sun. At the least noise it raises its head to listen, and in a menacing attitude; when attacked, it snorts and gnashes its teeth, and defends itself resolutely, inflicting severe wounds. There is a superstition among the people of the Ukraine, that the hand which has suffocated one of these animals is gifted with the virtue of curing scrofulous affections.

THE CANADA SAND-RAT

(*Geomys bursarius*; *Mus bursarius*, Shaw).

Fischer regards, and perhaps correctly, the genera *Saccophorus*, *Pseudostoma*, *Diplostoma*, and *Sacomys*,



53.—Skull and Teeth of Canada Sand-Rat.

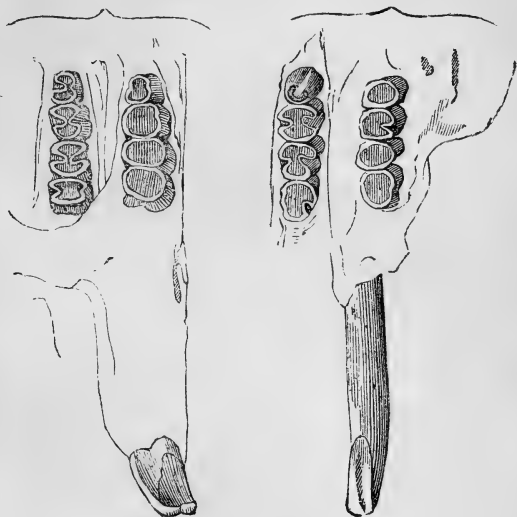
as synonymous with the genus *Geomys* of Rafinesque, and which is represented by the Sand-Rat, distinguished by large cheek-pouches, which when full have an oblong form and nearly touch the ground, but when empty are retracted for three-fourths of their length. Their interior is very glandular, particularly the orifice that opens

into the mouth. The incisors are $\frac{4-4}{4-4}$. Fig. 53 repre-

sents the skull and teeth of *Geomys*, as given by Dr. Richardson: 1, 2, 3, skull, natural size, in different

views: 4, lower jaw ; 5, palate and upper teeth; 6, upper grinder magnified. Fig. 54 represents the teeth of *Geomys* (*Saccomys*, F. Cuv.) enlarged.

The skull is large and depressed, the nose short, the nasal and frontal bones are in the same plane; the palate is very narrow, and the zygomatic arch is but little depressed below the upper surface of the skull.



54.—Teeth of Canada Sand-Rat.

The nostrils are somewhat lateral; the mouth is contracted; the pendulous cheek-pouches are thinly clothed with short hairs, and sometimes almost naked—they open into the mouth by the side of the molar teeth; auditory openings large, external ear almost obsolete; eyes small and far apart; body cylindrical; tail of moderate length, round, tapering, and more or less hairy. Limbs short; toes, five on each foot, with strong claws. (Fig. 55.)



55.—Canada Sand-Rat.

Dr. Richardson observes that the sand-rats burrow in sandy soils, and feed on acorns, nuts, roots, and grass, which they convey to their burrows in their cheek-pouches (Fig. 56); they throw up little mounds of earth, like mole-hills, in summer, but are not seen abroad in the winter season; speaking of the Columbia sand-rat, he observes, that when in the act of emptying its pouches it sits up like a marmot or squirrel, and squeezes the sacks against its breast with its fore-paws and chin. These animals commit great havoc on the potato-fields. The Canada sand-rat is known only from Dr. Shaw's description (in the 'Linnæan Transactions,' vol. v., p. 227) of a specimen in Mr. Bullock's Museum, and which afterwards passed into the hands of M. Temminck. There is no specimen in any of our museums; nor did Dr. Richardson see the animal in his expedition. It



56.—Canada Sand-Rat.

may, however, possibly prove to be identical with one of the species he has described. This animal is stated to be about the size of a common rat, and of a pale grayish brown. A specimen of the mole-like sand-rat (*G. talpoides*) is preserved in the collection of the Zool. Soc. It is a native of the borders of the Saskatchewan.

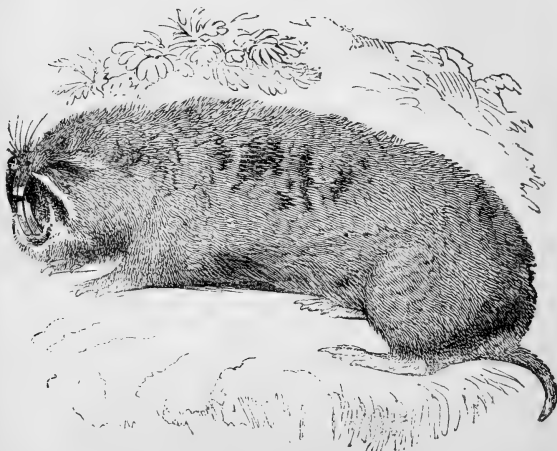
THE CAMAS POUCHED RAT (*Diplostoma bulbivorum*).

The animals of this genus differ from those of the genus *Geomys*, in having cheek-pouches which open ex-

ternally at the sides of the mouth, and are carried inwards and downwards along the side of the lower jaw; these pouches are not pendulous; the mouth is a vertical fissure nearly an inch long, entirely exposing the incisors; and the lateral fold of skin before the opening of the pouch is covered internally and externally with fur. The body resembles that of a great mole with a large clumsy head. (Fig. 57.)

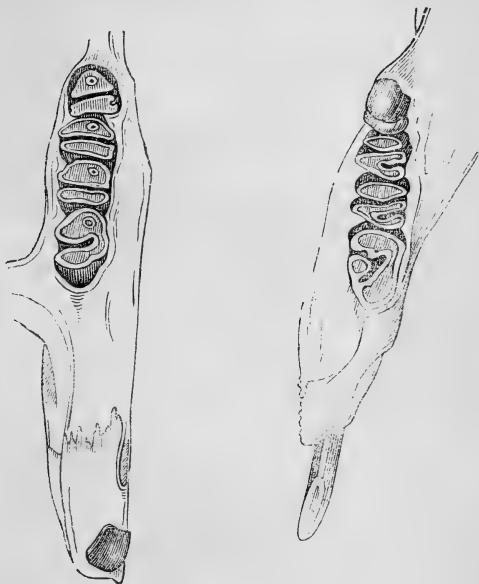
The animals of this genus were termed "Gauffres" by the early French travellers: there appear to be several species.

The Camas pouched rat is common in N. America, on the banks of the Columbia river, and the Multnomah, where it is known under the name of Camas rat, because the bulbous root of the Quamash or Camas-plant (*Scilla esculenta*) forms its favourite food. It is eleven inches long, and of a chestnut-brown colour. These animals



57.—Camas Pouched Rat.

are excessively voracious, and they are very destructive to beets, carrots, and similar vegetables. They live almost exclusively under ground, working their way like a mole, and are said to fill their cheek-pouches with the earth by means of their paws, and to empty them of their contents at the mouth of the burrow.

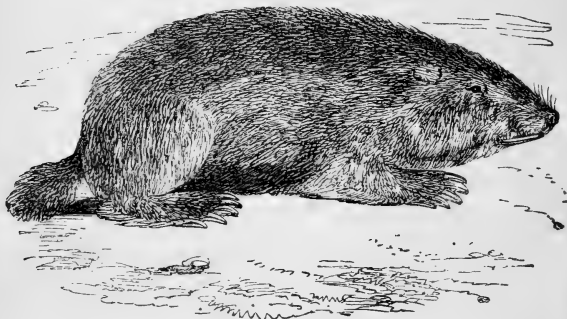


58.—Teeth of Coast Rat.

THE COAST-RAT (*Bathiergus maritimus*).

The dental form of *Bathiergus* (*Orycterus*, F. Cuv.) is as follows : Molars $\frac{4-4}{4-4}$ (see Fig. 58). In this genus

are comprehended several species of mole-like Rodents peculiar to Africa, the whole form and organization of which fit them for an underground existence. The most remarkable is the coast rat, or sand-mole of the downs. This species is a native of Southern Africa, frequenting sandy tracts along the coast. On the surface of the ground it proceeds slowly, but it burrows with great rapidity, and works out long galleries, throwing up hillocks as does the mole. In some districts these are extremely numerous, rendering it dangerous to pass over them on horseback, and not pleasant even on foot, the earth, where excavated, suddenly giving way. This animal is about a foot in length, exclusive of the tail, which is



59.—Coast Rat.

about three inches. (Fig. 59.) The incisors are of enormous size, and those above have a deep longitudinal furrow down the front; and a hairy palate extends behind them. The general colour is grayish ash.

THE RABBIT CERCOMYS.

This animal, which in shape resembles a rat, represents the genus *Cercomys*, closely allied to that of *Echymys*,



60.—Rabbit Cercomys.

containing the spiny rats. The molars are $\frac{4-4}{4-4}$ rooted.

The general colour of this species is deep brown above, paler on the sides and cheeks; all the under parts are whitish; the tail is long, like that of the rat; ears and eyes large. (Fig. 60.) It is a native of Brazil, but of its habits we have no detailed accounts. The teeth of the genus *Echymys* (a South American group) are figured in 61.

CUMING'S OCTODON

(*Octodon Cumingii*; *Dendrobis Degus*, Meyen).

The family *Octodontidæ* is established for a few allied genera peculiar to South America, of which that termed

Octodon is the type. Molars $\frac{4-4}{4-4}$. The antorbital foramen is as large as the orbit, or nearly so. The de-

scending ramus of the lower jaw is deeply emarginated behind, and the posterior angle acute. Fig. 62 represents the skull of *Octodon* in different views; and the skull of an allied genus, *Ctenomys*, is given in Fig. 65.

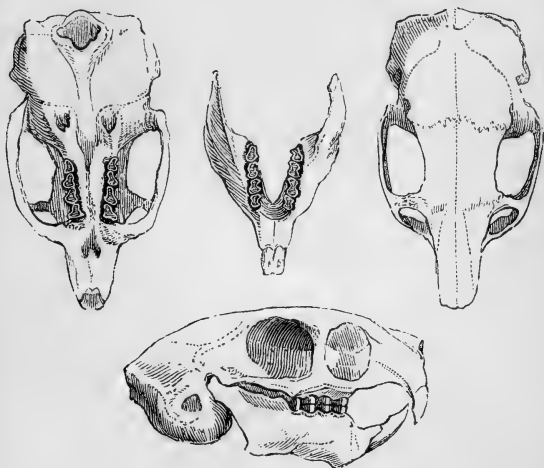
Cuming's *Octodon* in size and shape resembles a water-rat. General colour brownish gray clouded with dusky black; under surface dusky gray; base of the tail beneath nearly white. (Fig. 63.)



61.—Teeth of *Echymys*.

These animals are exceedingly abundant in the central parts of Chile. They frequent by hundreds the hedge-rows and thickets, where they make burrows which communicate with one another. In the neighbourhood of Valparaiso multitudes may be seen together feeding fearlessly in the day-time. Sometimes they ascend the lower branches of small shrubs, but not often. They are very destructive to fields of young corn. On being dis-

turbed, they all run like rabbits to their burrows. When running they carry their tails raised up, more like squirrels than rats; and they also sit up like those animals. According to Molina they lay up a winter store of food, but do not become dormant. The *Octodon* is the Degu of that writer: he says that the Indians used formerly to eat them with much relish. Piebald and albino varieties are not uncommon. The greatest enemy of these active little creatures is a species of horned owl, which feeds chiefly upon them.



62.—Skull of Cuming's Octodon.

THE TUCUTUCO (*Ctenomys Magellanicus*).

General colour brownish gray tinged with yellow and slightly varied by a blackish tint; under parts paler; chin and throat pale fawn. Length of head and body



63.—Cuming's Octodon.

about seven inches; of the tail about two inches and a quarter. Toes, as in *Octodon*, five on each foot. (Fig. 64.) The skull in different views is shown in Fig. 65.

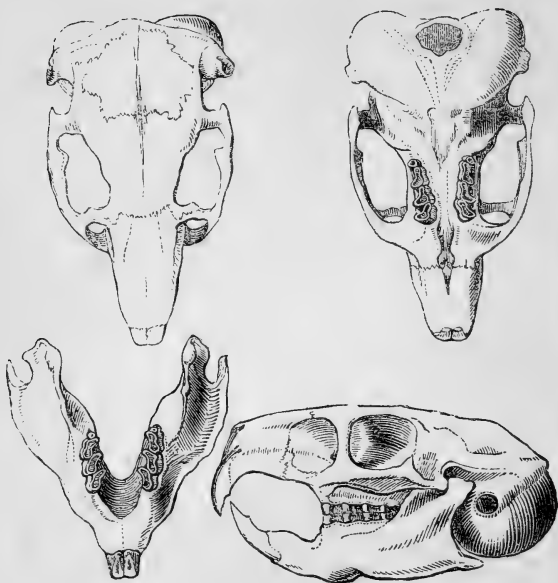
Locality.—The east entrance of the Strait of Magalhaens at Cape Gregory and the vicinity. (King.) The wide plains north of the Rio Colorado are undermined by these animals; and near the Strait of Magalhaens, where Patagonia blends with Tierra del Fuego, the whole sandy country forms a great warren for them.

Mr. Darwin ('Journal and Remarks') gives a circumstantial account of this curious animal, which he well describes as a Rodent with the habits of a mole. "The

tucutuco," says that author, "is extremely abundant in some parts of the country, but is difficult to be procured, and still more difficult to be seen when at liberty. It lives almost entirely underground, and prefers a sandy soil with a gentle inclination. The burrows are said not to be deep, but of great length. They are seldom open; the earth being thrown up at the mouth into hillocks, not quite so large as those made by the mole. Considerable tracts of country are so completely undermined by these animals, that horses, in passing over, sink above their fetlocks. The tucutucos appear, to a certain degree, to be gregarious. The man who procured specimens for me had caught six together, and he said this



64.—Tucutuco.



65.—Skull of Tucutuco.

was a common occurrence. They are nocturnal in their habits; and their principal food is afforded by the roots of plants, which is the object of their extensive and superficial burrows. Azara says they are so difficult to be obtained, that he never saw more than one. He states that they lay up magazines of food within their burrows. This animal is universally known by a very peculiar noise which it makes when beneath the ground. A person, the first time he hears it, is much surprised; for it is not easy to tell whence it comes, nor is it possible to guess what kind of creature utters it. The noise consists

in a short, but not rough nasal grunt, which is repeated about four times in quick succession; the first grunt is not so loud, but a little longer, and more distinct than the three following: the musical time of the whole is constant, as often as it is uttered. The name Tucutuco is given in imitation of the sound. In all times of the day, where this animal is abundant, the noise may be heard, and sometimes directly beneath one's feet. When kept in a room, the tucutucos move both slowly and clumsily, which appears owing to the outward action of their hind-legs; and they are likewise quite incapable of jumping even the smallest vertical height. When eating they rest on their hind-legs and hold the piece in their fore-paws; they appear also to wish to drag it into some corner. They are very stupid in making any attempt to escape; when angry or frightened, they utter the tucutuco. Of those I kept alive, several, even the first day, became quite tame, not attempting to bite or to run away; others were a little wilder. The man who caught them asserted that many are found blind. A specimen which I preserved in spirits was in this state. When the animal was alive I placed my finger within half an inch of its head, and not the slightest notice was taken: it made its way, however, about the room nearly as well as the others."

THE UTIA

(*Capromys Furnieri*; *Isodon Pilorides*, Say).

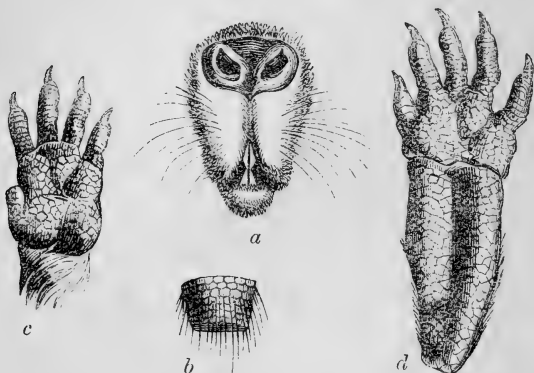
Mr. Waterhouse considers the genus *Capromys* as one of those included in the *Histricine* section of Rodents. The anterior paws have four toes and a rudimentary thumb; the hind-feet are thick, broad, and strong, and five-toed; the claws are strong; the soles of all the feet are naked, and covered with a coarse granular black skin, divided into pads by deep fissures. The muzzle is obtuse; the nostrils are open, oblique, edged externally with an elevated rim, and separated by a medial furrow, running to the fissure of the upper lip. The whiskers are long; the tail is annulated with a scaly epidermis,

with short thinly-set hairs from between each scale. (Fig. 65*: *a*, muzzle; *b*, portion of tail; *c*, under part of fore-foot; *d*, under part of hind-foot.) The ears are

moderate, erect, almost rounded. Molars $\frac{4-4}{4-4}$, with

the crown traversed by folds of enamel. Eyes small.

This animal is a native of Cuba, where it is known by the name of *Utia*. It appears to have been described by Bomare and Oviedo three hundred years ago. The general colour of the *utia* is glossy brown grizzled with yellowish gray; the muzzle, chest, and under parts



65*.—Muzzle and Paws of *Utia*.

grayish white; the fur of a coarse texture; length about two feet two inches, of which the tail is eight inches. (Fig. 66.)

With respect to the habits of the *utias* in a wild state, it is only known that they are found in the woods, that they climb trees with great facility, and that they live on vegetables. From observations on those kept in a domesticated state, M. Desmarest gives the following de-



66.—Utia.

tails :—" Their intelligence appears to be developed to as great a degree as that of rats and squirrels, much more so than that of rabbits and guinea-pigs. They have, indeed, a great share of curiosity. At night they are very wakeful, and the form of the pupils is indicative of nocturnal habits. The sense of hearing does not appear to be so acute as that of rabbits or hares. Their nostrils are incessantly in motion, especially when they smell any new object. Their taste is sufficiently delicate to enable them to distinguish and reject vegetables which have been touched by animal substances, to which they manifest the greatest repugnance. They agree perfectly well together, and sleep close by each other. When they are apart they call each other by a sharp cry, differing little from that of a rat. Their voice, when

they express pleasure, is a low soft kind of grunting. They scarcely ever quarrel except for food—as when one piece of fruit is given between both; in that case one seizes and runs away with it, until the other is able to take it from him. They sometimes play for a long time together, holding themselves upright in the manner of kangaroos, firmly supported upon the broad soles of their hind-feet and the base of the tail, and striking each other with their paws, until one of them, finding a wall or some other body against which to support himself, acquires an additional power, and gains an advantage; but they never bite each other. Towards other animals they manifest the greatest indifference, paying no attention even to cats. They are fond of being caressed, and particularly of being scratched under the chin. They do not bite, but slightly press with the incisor teeth the skin of those who caress them. They do not ordinarily drink, but occasionally suck up water as squirrels do. Their food consists of vegetables exclusively, such as cabbage, succory, grapes, nuts, bread, apples, &c. They are not very difficult in the choice of their food, but still have a particular fondness for strong-flavoured herbs and aromatic plants, as wormwood, rosemary, geraniums, pimpernel, celery, &c. Grapes pleased them much, to obtain which they would instantly climb up a long pole, at the top of which the fruit was placed. They are also fond of bread steeped in aniseed or even wine. These animals are plantigrade: their movements are slow, and their hinder parts are embarrassed when they walk, as is observable in the bear. They leap occasionally, turning suddenly round from head to tail like the field-mouse. When they climb, which they do with the greatest ease, they assist themselves with the base of their tail as a support, and the same in descending. In certain positions, on a stick for example, the tail serves as a balance to preserve their equilibrium. They often raise themselves to a listening attitude, sitting erect, with the paws hanging down, like rabbits and hares. In eating they employ sometimes only one, sometimes both their fore-paws; the former is the case when the

substance they are holding is small enough to be held between the fingers and the tubercle at the base of the thumb."

THE COYPU

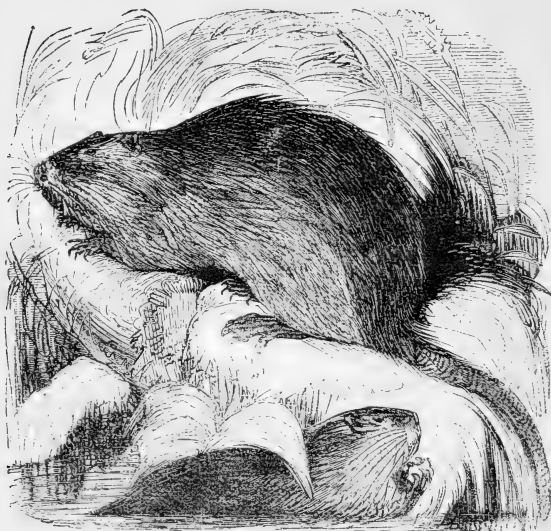
(*Myopotamus Coypus*; Quoiya, D'Azara; Couï, Molina; *Hydromys Coypus*, Geoff.; *Mus Castorides*, Burrow).

The coypu is common in certain districts of South America, as Chile, Buenos Ayres, and Tucuman. The head is large; the muzzle obtuse; the ears small and



67.—Teeth of Coypu.

round; fore-feet with a rudimentary thumb and four toes, all free: hind-feet plantigrade, with five toes, of which the outermost only is free, the rest palmated. Tail strong and scaly, and sprinkled with scattered hairs.



68.—Coypu.

Molars $\frac{4-4}{4-4}$, increasing in size from the first to the last, with winding folds of enamel. (Fig. 67.) The eyes are small, approximating to each other, and placed high in the head. Behind the upper incisors there is a hairy palate or space, a peculiarity noticed also in *Bathiergus*. The body is clothed with two sorts of hair, an undergarment of fine close fur almost water-proof, and an upper layer of long, shining, straight hairs of a rich brown, which is the general colour, the muzzle being dirty white. The limbs are short, but strong; and the movements of the animal on land are slow and crawling. (Fig. 68.)

The coypu remained unknown to the scientific world, while thousands of its skins, under the name of *Racoonda*, for more than forty years had been annually imported into Europe, for the sake of the fine under-fur, which, like that of the musquash and beaver, is extensively used in the manufacture of hats.

This animal is gregarious and aquatic, residing in burrows which it excavates along the banks of rivers: and in these burrows the female produces and rears her young, from three or four to seven in number, to which she manifests great attachment. In the Chonos Archipelago, according to Mr. Darwin, "these animals, instead of inhabiting fresh water, live exclusively in the bays or channels which extend between the innumerable small islets of that group." "The inhabitants of Chiloe, who sometimes visit this archipelago for the purpose of fishing, state that these animals do not live solely on vegetable matter, as is the case with those inhabiting rivers, but that they sometimes eat shell-fish. The coypu is said to be a bold animal, and to fight fiercely with the dogs employed in chasing it. Its flesh when cooked is white and good to eat. An old female procured on these islands weighed between ten and eleven pounds." An extensive trade in the skins of these animals is carried on at Buenos Ayres, where they are improperly called "Nutrias," or otters. In captivity the coypu soon becomes gentle and attached; and is evidently pleased with marks of attention from those with whom it is familiar. Length of adult male, one foot eleven inches, exclusive of the tail, which is one foot three inches.

FAMILY—HISTRICIDÆ, (OR PORCUPINES).

The porcupines, a spine-clad family, are divided into the genera *Hystrix*, *Erethizon*, *Synetheres*, &c., and are respectively distributed over Europe and North Asia, Africa, India and its islands, and North and South America. All the porcupines have the molars four in each jaw on each side; nearly equal in size, and furnished with distinct roots; when worn the surfaces

69.—Teeth of *Hystrix*.

present tortuous folds of enamel (see Fig. 69, the teeth of *Hystrix*, and Fig. 70, the teeth of *Erethizon*). The tongue is rough with papillæ, like those of the cats; the head is short and blunt; the nostrils large and open; the ears and eyes comparatively small; and the general form thick and clumsy.

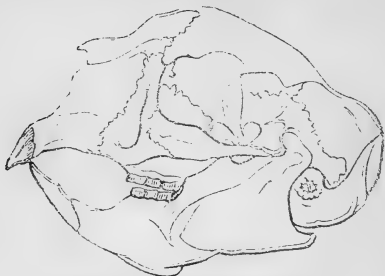
Two figures of skulls (Fig. 71 and 72) represent the skull of a species termed, by F. Cuvier, *Acanthion Javanicum*, and that of the common porcupine by way of comparison. With respect to the genus *Acanthion*, founded by F. Cuvier on the characters of two skulls, one of which was brought from Java, we are strongly inclined to consider it identical with the genus *Atherura* of Baron Cuvier, though the latter, in his 'Règne



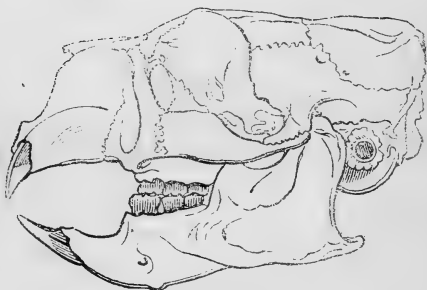
70.—Teeth of Erethizon.

Animal,' makes no allusion to the genus proposed by his brother. Fischer gives the *Acanthion Javanicum* of F. Cuvier as identical with the fasciculated porcupine (*Atherura fasciculata*), and is probably correct. The fasciculated porcupine has been long known to science, and is figured by Buffon as the "Porc-épic de Malacca;" but since his time, till within the few last years, no specimen had reached Europe. In 1828 M. Diard sent a skin and skeleton to France, from India, and about the

same time a living individual was brought to England by Lieut. Vidal, and presented to the Zool. Soc. Lond. It was described and figured by Mr. Bennett, and now forms a part of the riches of the museum. This individual, however, was not brought from India or its islands,



71.—Skull of *Acanthion Javanicum*.

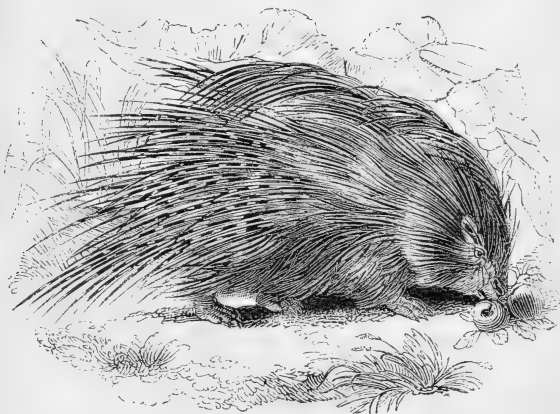


72.—Skull of Common Porcupine.

but from Fernando Po, where it is stated to be in such abundance as to furnish a staple article of food to the inhabitants. Whether it be truly indigenous there, or was originally brought by the early Portuguese settlers to that island from India or Java, and has become naturalized, are points unsettled.

THE COMMON PORCUPINE (*Hystrix cristata*),

Porc-épic of the French : Istrice of the Italians ; Stachelschwein, Dornschwein, and Porcopick of the Germans. This spine-covered animal is found in Italy, throughout Africa, in Southern Tartary, the borders of the Caspian Sea, Persia, and India : it was observed by Mr. Hodgson inhabiting the central and lower regions of Nepâl. When full-grown it is upwards of two feet in length ; but the specimens from Italy are generally smaller than the African, and have shorter quills. (Fig. 73.) It would appear that in Italy it is not indigenous, but has become naturalized.



73.—Common Porcupine.

The porcupine is a nocturnal animal, of quiet and secluded habits, passing the day in its subterranean retreat, for the digging of which its muscular limbs and stout claws are well adapted. At night it steals forth to feed ; roots, bark, fruits, and vegetables constitute its diet.



74.—Common Porcupine.

In winter it appears to undergo a partial hybernation. Sluggish and timid, the porcupine is yet enabled, clothed in his array of spears, to repel the assault of enemies: when driven to act on the defensive, he bends his head down, turns his back towards his assailant, erects his spines, and receiving the rash assault, pushes them forcibly by the action of the whole body against the aggressor. (Fig. 74.) The wounds thus inflicted are very severe, and do not heal readily. The spines of the porcupine are of two sorts: one sort being long, slender, and bending; the other spines, concealed beneath the former, are short, thick in the middle, and tapering to a sharp point; they are ringed black and white. The length of the short spines, which are the true effective weapons, is from four to ten inches, and the point, which consists of flint-like enamel, is somewhat compressed with two slightly raised and opposite ridges, which when minutely examined are found to be finely jagged. There is another sort of furniture on the tail, namely a number of

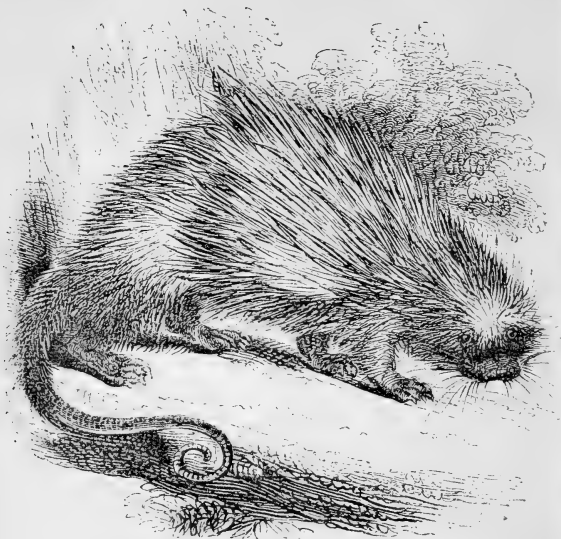
dry, hollow, open quills, of considerable circumference, and supported upon long and very slender stalks, which vibrate with every motion. When the porcupine clashes these together they produce a rustling noise. The apparatus by which the spines and these hollow rattles are clashed and raised consists of a strong muscular expansion underneath, and adherent to, the thick skin. From the raising and clashing of the spines, and perhaps the accidental falling of one looser than the rest (about to be shed naturally), has arisen the belief that the animal was capable of darting his spines, like a javelin, point foremost—an error we need not stay to confute.

THE BRAZILIAN PORCUPINE

(*Syntheres prehensilis*; *Cuandu* of Marcgrave; *Coendu*, Buffon; *Prehensile Porcupine* of Pennant).

In North America the porcupines are represented by the Hairy or Canada Porcupine (*Erethizon dorsatum*), which is in a great degree arboreal in its habits. In Brazil we are presented with the species termed *Cuandu*, more decidedly organised as a climber, having a prehensile tail resembling that of the opossum. The muzzle is broad and short; the head convex in front, the spines rather short; the tail very long, and naked for half its length. The feet have only four toes. The length of this species is about two feet, exclusive of the tail, which is about eighteen inches; the nose is covered with brownish hair; the ears are nearly naked; the body is covered above with spines: the longest (on the lower part of the back) are about three inches in length; those on the sides and base of the limbs are the shortest. All are sharp, and barred near their points and roots with white; brown in the middle. The basal half of the tail is clad with short spines; the breast, under parts, and lower portion of the limbs with dark brown bristles. (Fig. 75.)

The Brazilian porcupine appears very much to resemble the Canada porcupine in its habits, living in woods, sleeping by day, and feeding on fruits, &c. by



75.—Brazilian Porcupine.

night. Marcgrave states that its voice is like that of a sow. The quills are stated to have the same penetrating and destructive quality as those of the Canadian species. It is a sluggish animal, climbing trees very slowly, and holding on with its prehensile tail, especially in its descent. It grows very fat, and the flesh is said to be white and well-tasted. Our cut is taken from a specimen in the garden of the Zoological Society.

Col. Sykes regards the porcupine of the Dukhun, called "sayal" by the Mahrattas, as distinct from the ordinary species. It is nearly a third larger, and all the spines and tubes of the tail are entirely white; the spines

are also so long as to reach the insertion of the tail. The ears are much less rounded, and the nails shorter and stronger. We have compared skulls of the common Indian and African porcupines together, in the Paris Museum, and other bones of the skeleton, and we perceived a marked difference in many details. To the Indian species or variety Col. Sykes has given the title *H. Leucurus*; it is very abundant, and good eating. Like the African porcupine, when alarmed or irritated it shakes the tubes and spines of its tail violently, producing a startling noise. It stamps also with great energy, and when it assails an adversary it runs obliquely backwards, transfixing the foe with its spines. (See 'Cat. Mamm. of Dukhun,' p. 10, and 'Zool. Proceeds.' 1831, p. 103.)

FAMILY—CHINCHILLIDÆ.

To the animals of this family, of which the beautiful chinchilla is the type, the attention of English naturalists was first called by Mr. Bennett, whose admirable paper on the subject will be found in the first volume of the 'Trans. Zool. Soc.' In this paper three genera are clearly and fully characterized, viz.: *Lagotis*, Benn.; *Chinchilla*, Benn.; and *Lagostomus*, Brookes. The *Chinchillidæ* are all peculiar to South America, and are burrowing and gregarious in their habits. Their food is exclusively vegetable. The molar teeth are $\frac{4-4}{4-4}$ destitute of true roots.

THE CHINCHILLA (*Chinchilla lanigera*).

The characters of the genus *Chinchilla*, as established by Mr. Bennett, are as follows:—Molars, $\frac{4-4}{4-4}$, crossed obliquely on their surface by three lines of enamel. Toes, on the fore-feet, five; on the hind-feet, four. Tail of moderate length, and hairy; ears broad, rounded,

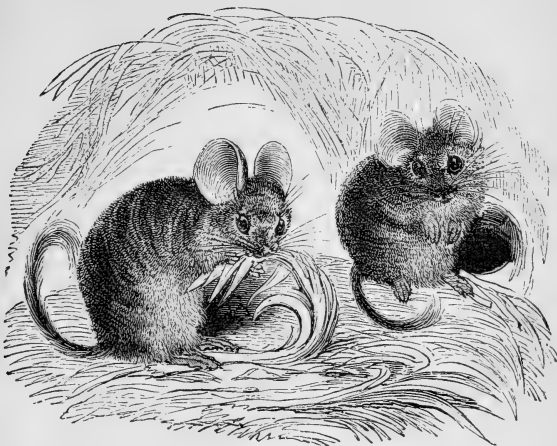
and nearly naked ; eyes large and full ; fur long, thick, close, soft, and woolly.

The chinchilla appears to have attracted in very early times the notice of travellers, though the accounts scattered in their works have been but little regarded by naturalists. In 1824 Schmidtmeier, in his travels over the Andes into Chile, notices the chinchilla as a "woolly field-mouse which lives underground, and chiefly feeds on wild onions. Its fine fur is well known in Europe ; that which comes from Upper Peru is rougher and larger than the chinchilla of Chile, but not always so beautiful



76.—Chinchilla.

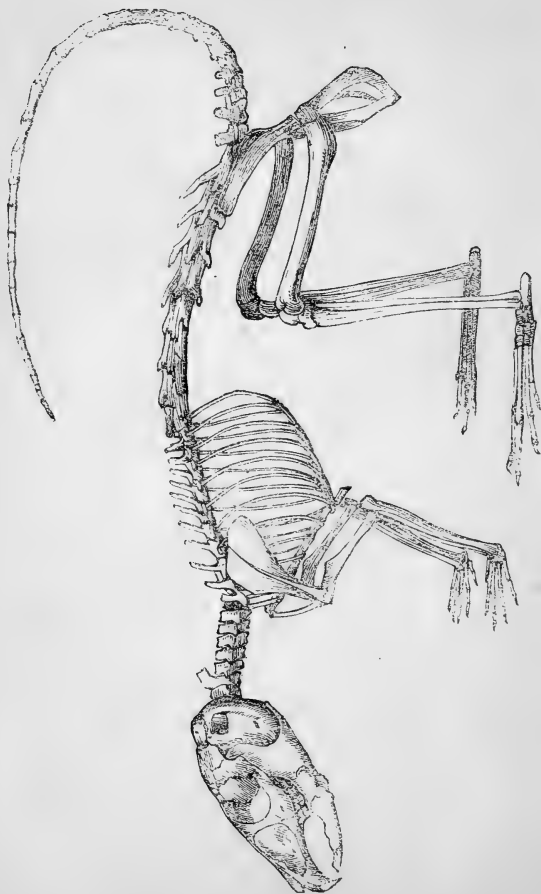
in its colour. Great numbers of these animals are caught in the neighbourhood of Coquimbo and Copiapo, generally by boys with dogs, and sold to traders, who bring them to Santiago and Valparaiso, from whence they are exported. The Peruvian skins are either brought to Buenos Ayres from the eastern parts of the Andes or sent to Lima. The extensive use of this fur has lately



77.—Chinchilla.

occasioned a very considerable destruction of the animals.” From this passage it would appear that there are two or more species of chinchilla, respectively Chilian and Peruvian, and hence we suspect is to be accounted for the difference in the colour and quality of the chinchilla fur which we have frequently observed. Our examination of specimens in the Paris Museum also leads us to the same conclusion. (Figs. 76 and 77.)

A native of the valleys in the high mountain districts of South America, where the cold is often very severe, the deep woolly coat of the chinchilla is well calculated for preserving warmth. Whether in the winter season the animal hybernates or not yet remains to be discovered. Of its manners, indeed, we know little. In captivity it is quiet, inoffensive, and cleanly: it feeds sitting up on its haunches like a squirrel, holding its food between its fore-paws. Its ratio of intelligence is on the same par



78. - Skeleton of Chinchilla.

with that of the rabbit or guinea-pig: hence it displays no indications of attachment to those who feed it, nor much animation or playfulness. In its alpine valleys it associates in numbers, excavating burrows, in which it resides. The female breeds twice a year, producing from four to six young at a birth. Various roots, especially those of bulbous plants, constitute the diet of the chinchilla. The colour of the fur of this species is clear gray above, but varying in depth, and passing into white on the under parts: its quality is exquisitely fine, and its length renders it well adapted for spinning. Indeed, Molina informs us that "the ancient Peruvians, who were far more industrious than the modern, made of this



79.—Skull of Chinchilla.

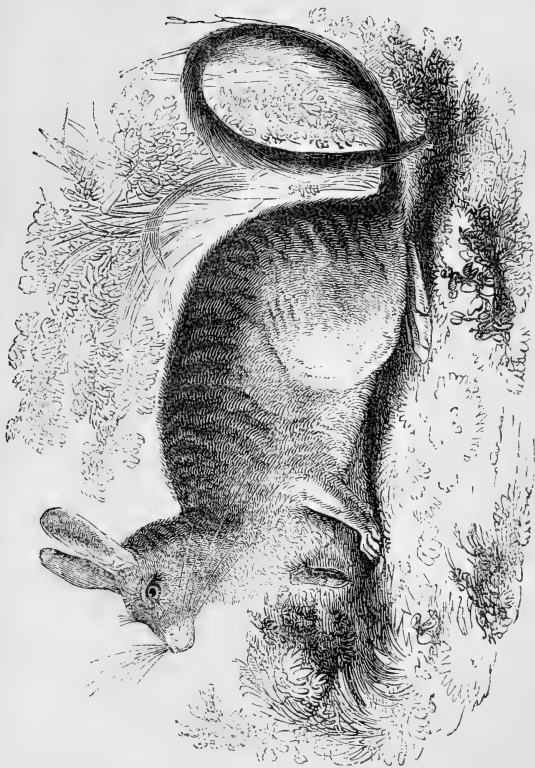
wool coverlets for beds, and valuable stuffs." The tail is covered with long bushy hairs, and usually kept turned up towards the back. In length the chinchilla measures about nine inches, exclusive of the tail, which is five inches. The fore-limbs are comparatively short: the head has much resemblance to that of a young, full-haired rabbit; the muzzle is short and blunt, and furnished with long whiskers; the eyes are black; the ears are ample. The skull is remarkable for the size of the antorbital foramen and the amplitude of the tympanic bulla. The general skeleton is slightly built, and the bones are slender; the ribs are thirteen on each side. Fig. 78 represents the skeleton of the *Chinchilla*

Lanigera; and Fig. 79 the skull: *a*, skull seen from above; *b*, the same seen from below; *c*, the lower jaw.

CUVIER'S LAGOTIS (*Lagotis Cuvieri*).

Of the genus *Lagotis* two species were described and figured by Mr. Bennett (see the 'Trans. Zool. Soc.,' vol. i.). In this genus the toes of the anterior as well as posterior feet are four. The hind-limbs are considerably developed; the muzzle is somewhat elongated and narrow, and furnished with long whiskers; the eyes are moderate, but prominent; the ears are elongated, rounded at the tip, and rolled inwards at the edges. The fur is soft, long, and downy, and but loosely attached to the skin. The tail of tolerable length, and bushy, with long, stiff, wiry hairs. General contour rabbit-like. (Fig. 80.)

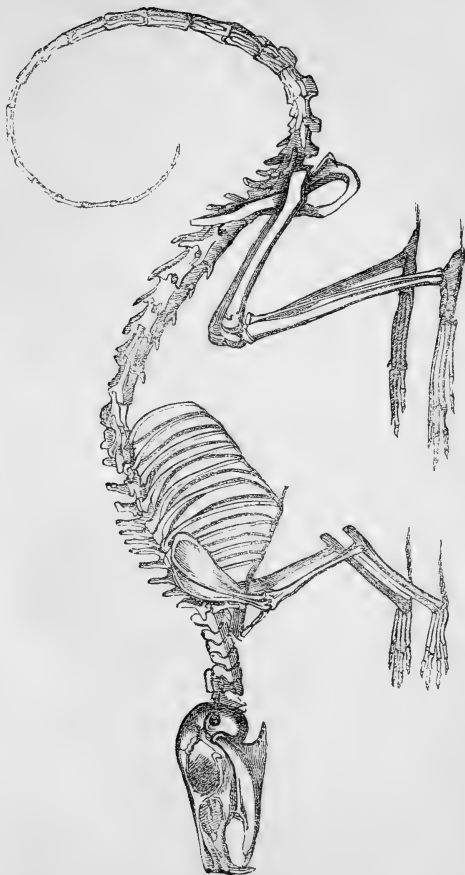
M. Desmarest was the first to suggest that a viscacha observed by Feuillée in Peru, and, as he says, often domesticated in the houses at Lima, was a distinct species from the viscacha of the Pampas; and a careful examination of the scattered notices published by travellers respecting the viscachas of the eastern and western sides of the Andes led Mr. Bennett to form the same opinion, which was confirmed by the acquisition of a living animal regarded as the Peruvian viscacha of the older writers. The references to the Peruvian viscacha by various of the early travellers in South America are by no means limited, and in collating them Mr. Bennett evinced a spirit of laborious research. He refers to Pedro de Cieça, 1554; Acosta, 1590; Garcilago de la Vega, 1609; Nieremberg, 1635; Feuillée, 1725; and Antonio de Ulloa, 1772. The last writer, in his 'Noticias Americanas,' gives a correct account of the habits and manners of the animal in question. Mr. Bennett's translation is as follows:—"Taking the place of the rabbit, which is wanting in Peru, there is another kind of animal, called viscacha, which is not found in Quito. In form and in the colour of the fur it is similar



80.—Cuvier's Lagotis.

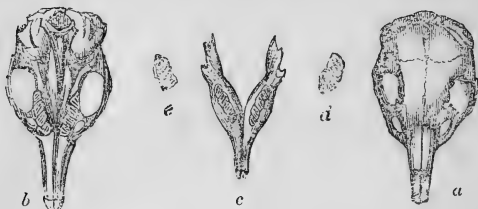
to the rabbit, but differs from it in having a long tail furnished with tufted hair, which is very thin towards the root, but thick and long as it approaches the tip. It does not carry its tail turned over the head like the squirrel, but stretched out, as it were, in a horizontal direction: its joints are slender and scaly. These animals conceal themselves in holes of the rocks, in which they make their retreats, not forming burrows in the earth like rabbits. There they congregate in considerable numbers, and are mostly seen in a sitting posture, but not eating: they feed on the herbs and shrubs that grow among the rocks, and are very active. Their means of escape do not consist in the velocity of their flight, but in the promptitude with which they run to the shelter of their holes. This they commonly do when wounded; for which reason the mode of killing them is by shooting them in the head; as, if they receive the charge in any other part, although much injured, they do not fail to go and die in the interior of their burrows. They have this peculiarity, that as soon as they die their hair falls off; and on this account, although it is softer, and somewhat longer and finer, than that of the rabbit, the skin cannot be made use of for common purposes. The flesh is white, but not well flavoured, being especially distasteful at certain seasons, when it is altogether repugnant to the palate." Molina speaks of the employment of its wool among the ancient Peruvians, adding, that the Chilians of the present day (his work was originally published in 1782, and reprinted with additions in 1810) use it in the manufacture of hats.

The general colour of the viscacha of the western acclivities of the Peruvian Andes, or Cuvier's lagotis (*L. Cuvieri*), is grayish ash, clouded here and there with a tint of brown. The hairs of the tail are mingled black and white. The ears equal the head in length. The body measures sixteen inches, including the head; the tail, about twelve inches. Fig. 81 represents the skeleton, and Fig. 82 the skull of the *Lagotis Cuvieri*: *a*, skull seen from above; *b*, the same seen from below; *c*,



81.- Skeleton of Cuvier's Lagotis.

lower jaw ; *d*, crown of the two anterior molar teeth of the lower jaw, enlarged ; *e*, crowns of the two posterior molar teeth of the upper jaw, enlarged.



82.—Skull of Cuvier's *Lagotis*.

THE VISCACHA OR BISCACHA OF THE PAMPAS

(*Lagostomus trychodactylus*, Brookes ; the *Marmot Diana* of Griffith).

Generic characters:—the molars consist of two oblique lamellæ, excepting the posterior one in the upper jaw, which consists of three ; anterior feet with only four toes, hinder feet with only three ; tail moderate. Of this genus (*Lagostomus*) we know but one species, of which the earliest notice to be found is in Dobrizhoffer's 'Historia de Abiponibus,' 1784. He informs us that it is called by these people *Nehelaterek*, and that it resembles a hare with the tail of a fox. (Fig. 83.) "It digs its burrows on the more elevated parts of the plains with so much art, that no aperture is left by which the rain can penetrate, and these burrows are divided into distinct settlements, numerous families inhabiting the same locality. On the surface of the ground are several entrances into the burrow, at which, towards sunset, the animals may be seen seated in crowds, diligently listening for the sound of any person approaching. If everything remains quiet, they venture forth by moonlight to feed ; and commit sad havoc on the neighbouring fields,



83.—Viscacha.

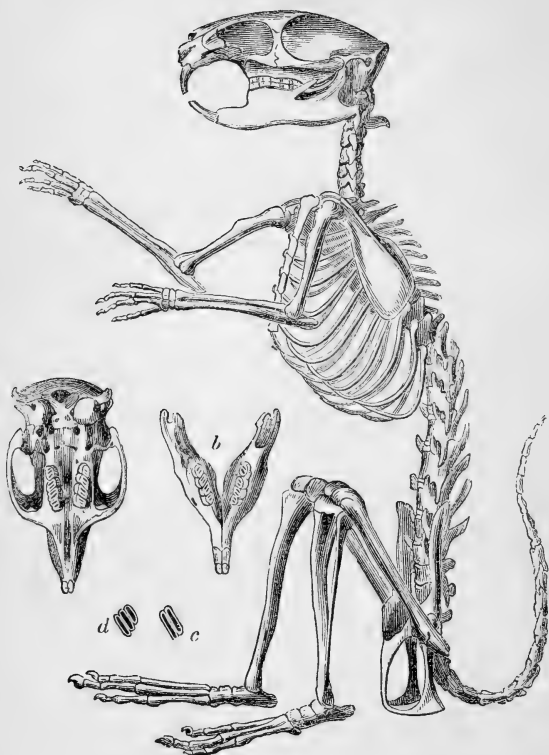
for they devour both European wheat and Indian corn with great avidity, despising grass when either is to be obtained. Hence the stations of the biscachas are seldom to be met with in the desert plains, but indicate with certainty the proximity of Spanish settlements; and it has often been a matter of surprise to me that I have never seen the biscacha in the territories (though well covered with crops of all kinds) either of the Abipones or the Guaranis. They are in the habit of heaping up at the entrances of their burrow dry bones, chips of wood, and refuse articles of every sort which fall in their way. The purpose, however, for which these things are collected is beyond conjecture. The Spanish colonists occasionally spend an idle hour in hunting them;

they pour buckets of water into the subterranean retreats of the creatures, which to avoid being drowned issue forth into the plain, where, without any means of escape, they are killed with sticks. Their flesh, unless they are very old, is not considered despicable even by the Spaniards." In 1789 the Abbé Jolis wrote a work, which, however, appears not to have been completed, entitled 'An Essay on the Natural History of Granchaco' (Saggio sulla Storia Naturale della Provincia del Granchaco), and in this he gives, from long observation, a description of the Pampas biscacha, which differs in some particulars from that of Dobrizhoffer. "They resemble," he says, "our hares, but have the body somewhat more arched. They live in society, in burrows underground, which they form for themselves, excavating in all directions to the extent of a mile in circumference, with various exits and separate retreats, in which the old live distinct from the young. The soil in which these are usually made is that which is hard and barren, and destitute of everything, but with bushes (*boscaglie*) at no great distance, and pasture of tender grass, roots, and the bark of trees. They collect around their retreats bones, dried leaves, and whatever they find in the neighbourhood; if anything is missing in their districts, it is to be found with certainty piled up in these situations the following day. As they are animals that avoid the light, having little power of vision, they are not to be seen in the daytime, unless at dawn, or towards evening after sunset. The night, and especially when the moon shines, is the proper time for seeking their food. Fierce and courageous, they defend themselves with all their might against the dogs, and sometimes even attack the legs of the hunters."

But neither of those authors mentions the somewhat anomalous companions with which the biscachas are associated; and we select, from the travels of Proctor, Head, Miers, and Haigh, the account of the first-named traveller, which, as Mr. Bennett observes, gives nearly all the particulars which are to be found in the rest. "The whole country from Buenos Ayres to San Luis de

la Punta is more or less burrowed by an animal between a rabbit and a badger, called the biscacho, which renders travelling dangerous, particularly by night, their holes being so large and deep that a horse is almost sure to fall if he steps into one of them. The biscacho never ventures far from its retreat, and is seldom seen till the evening, when it comes out to feed, and hundreds may be observed sporting round their holes, and making a noise very similar to the grunting of pigs. Their flesh is much liked by the people, and they are remarkably fat, and on that account, when caught at any distance from their holes, are easily run down; they will, however, defend themselves from a dog a considerable time. The holes of these animals are also inhabited by vast numbers of small owls, which sit, during the day, gazing at the passing travellers, and making a very ludicrous appearance. The parts of the road most frequented by the biscacho are generally overrun by a species of small wild melon, bitter to the taste; whether it thrives particularly on the manure of the animal, or whether the biscacho chooses its hole near this running plant, does not seem to have been ascertained."

The viscacha of the Pampas of Buenos Ayres and Paraguay is, when fully grown, as large as our common badger. Above it is of a blackish gray, beneath white. The head is large and obtuse, and a whitish band beginning on the nose passes across the face beneath each eye to the root of the ear, producing a sort of crescent-shaped mask when the face is viewed in front. The sides of the lips are furnished with a tuft of thickly-set whiskers, composed of long black bristles; and from the angles of the mouth across the cheeks, below the white band, extends a brush of black bristles, stouter than those of the whiskers, but shorter, the lowermost being sharply pointed. This brush reaches the angle of the jaw, forming a beard: it does not, however, end here abruptly, but may be traced by bristly hairs intermingled with the fur across the shoulders as far as the middle of the back. The ears are moderate and rounded; the fore-legs are rather slender and short; the hind-legs are long, and the



84.—Skeleton and Skull of Viscacha.

metatarsal portion reminds one of the same part in the limb of the kangaroo, though it is not so disproportionally elongated. At the heel there is a long naked callous sole or pad, before which is a part covered with hair: the toes are three in number, of which the middle is the most elongated: all are furnished with strong hoof-like nails, and with naked pads beneath. The tail is rather short, and covered with grayish brown hairs, of which the longest form a fringe on the upper surface; it is generally kept retroverted on the back. The incisor teeth are remarkably large and strong. Fig. 84 represents the skeleton and skull of the Pampas viscacha: *a*, under view of skull; *b*, lower jaw; *c*, crown of the second molar tooth of the left side of the lower jaw; *d*, crown of the last molar tooth of the right side of the upper jaw.

Mr. Brookes's paper on the anatomy of this animal was read before the Linn. Soc. in June, 1828, and published in the Linn. Trans. for the year following.

FAMILY—DASYPROCTIDÆ.

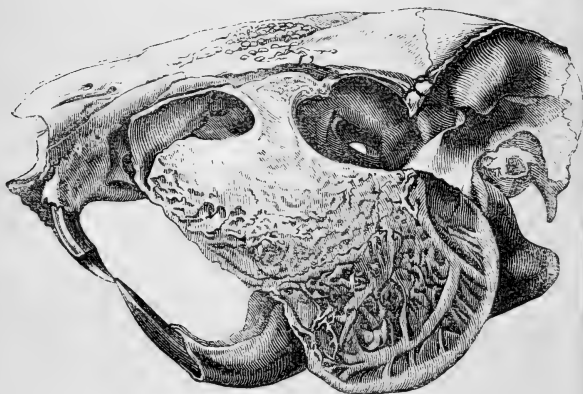
A small family of the *Histricine* section, which may be termed *Dasyproctidæ*, next claims our notice. It embraces two genera, *Cælogenys* and *Dasyprocta*. In

these genera the molars are $\frac{4-4}{4-4}$, rooted, and bear much resemblance to those of the porcupines; they are crowned with distinct tubercles, which, wearing down with use, give place to winding lines of enamel, set in the interior bony cement.

The genus *Cælogenys* includes two, or perhaps three, distinct species of Rodents, termed Pacas (a corruption of the word Pag of the Brazilians, or Paig of the natives of Paraguay; and Pakiri of some of the tribes of Guiana).

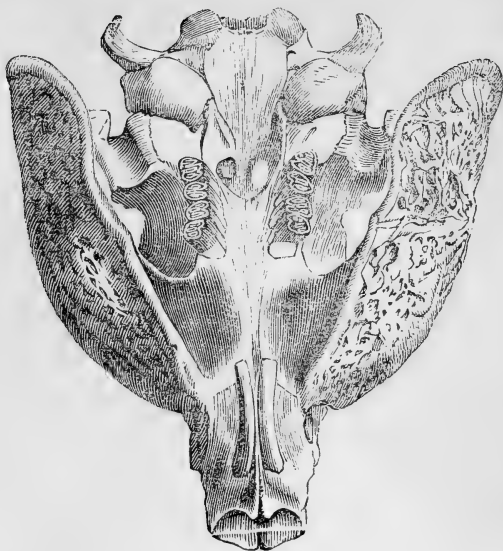
These animals, the pacas, are remarkable for a curious structural peculiarity in the skull, which imparts a singular aspect to their physiognomy. We give a sketch of

the skull of the fulvous paca (*Cælogenys fulvus*), in profile (Fig. 85), and as viewed on its palatal aspect (Fig. 86). The peculiarity in question is the immense development of the zygomatic arch, forming an expansive shield of bone, almost concealing the lower jaw, rough and convex externally, and deeply concave within. This broad projecting convex plate has its concavity lined by a continuation or reduplication of the skin of the face, constituting a sort of pouch, with a narrow linear opening just below the angle of the mouth, and having its edges, from which the pouch leads directly upwards, almost if not quite destitute of hair.



85.—Skull of Paca.

Notwithstanding this narrow orifice, the sac or pouch is so closed, that it cannot be serviceable as the receptacle for food, for neither is the orifice dilatable, nor the pouch, enclosed as the latter is within walls of unyielding bone. The use of this sac is not ascertained: perhaps a secretion of some kind may take place from the subzygo-



86.—Upper Jaw of Paca.

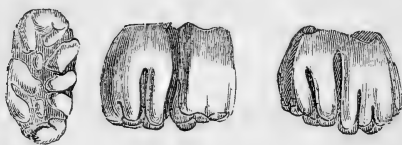
matic fold of skin, but this remains to be determined. Besides the sac described, the pacas have true cheek-pouches of considerable extent, opening from the mouth, and extending down the sides of the neck and below the inferior margin of the zygomatic shield.

The lower jaw, which is almost concealed, is shown at Fig. 87. The characters of the molar teeth, worn by use, are well depicted. Fig. 88 represents the germ of the first molar, before the tooth is completely developed, in three views, namely, the outer aspect, the inner aspect, and the crown with its tubercles. The pacas are animals of considerable size, and of a heavy clumsy figure, having

a thick muzzle, with the upper lip deeply cleft ; a large inelegant head ; prominent eyes, rounded ears, and stout limbs, of which the hinder pair exceed in length the anterior—but as the greater portion of the tarsus rests habitually on the ground, the body sinks even lower at the haunches than at the shoulders. The fore-feet are divided into five toes, of which the innermost is a mere



87.—Lower Jaw of Paca.

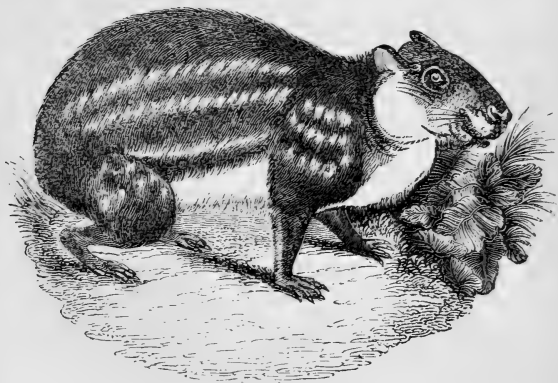


88.—Tooth of Paca.

rudiment, seated high, and furnished with a small claw. The hind-feet have also five toes, but of these the outermost on each side is small, and seated high : the three central are large, strong, and furnished with powerful hoof-like nails. The tail is wanting. The body is clothed with short, stiff, wiry hairs.

THE DUSKY PACA.

This species, according to Cuvier, is identical with the fulvous paca; but we have examined the skulls, and find them different. In the dusky paca the bones of the skull are smooth, and the zygomatic arches less inordinately developed. The general colour of the dusky paca is brownish black, with four lateral rows of white spots, which begin on the shoulders and terminate on the buttocks. The lowest line is almost confounded with the white of the under surface. The sides of the lower jaw, the throat, and chest are also white. Total length of head and body, about two feet; average height fourteen



89.—Dusky Paca.

inches. (Fig. 89.) These animals are natives of the whole of the eastern portion of South America, from Surinam to Paraguay, and formerly existed also in some of the islands of the West Indies. Forests in the vicinity of water; wooded, marshy places; and borders of rivers, are their favourite localities: they inhabit burrows,

which they excavate, but so superficially, that they are apt to give way beneath the foot of a person passing over them, no less to his annoyance than that of the animal, which thus suddenly finds itself in open daylight. These burrows have, as it is asserted, three openings, which the animal conceals with dry leaves and branches. In order to capture the paca alive, the hunter stops two of these apertures, and proceeds to work at the third, till he arrives at the chamber to which the avenues lead. Driven to an extremity, the paca makes a desperate resistance, often inflicting very severe wounds.

When not disturbed, the paca often sits up and washes its head and whiskers with its two fore-paws, which it licks and moistens with its saliva at each ablution, like a cat; and with these fore-paws, as well as with the hind ones, it often scratches itself and dresses its fur. Though heavy and corpulent, it can run with a good deal of activity, and often takes lively jumps. It swims and dives with great adroitness, and its cry resembles the grunting of a young pig. Its food consists of fruits and tender plants, which it seeks in the night, hardly ever quitting its burrow in the day, the strong light of which, as is the case with other nocturnal animals, is oppressive to its eye: the planter often rues the visits made by these midnight foragers to his sugar-canes. The female is said to bring forth at the rainy season, and to produce but a single young one, which stays a long time with the mother. The pacas are very cleanly creatures in all their habits, and keep their subterranean dwelling in a state of the utmost purity.

It appears that these animals root in the ground with their nose—a circumstance which, taken in conjunction with their voice, a pig-like grunt, the bristly character of their hair, and the flavour of their flesh, probably gave rise, as Mr. Bennett observes, to the comparisons made by the older writers between them and the tenant of the sty. Those which we have seen in captivity were gentle, but certainly not intelligent; and so far we agree with M. F. Cuvier, who observes that, when the animal is offended, it throws itself violently at the object which

has displeased it, and then makes a kind of grumbling, which at length breaks out into a sort of bark. The greater part of the day it passes in repose, delighting in a soft bed, which it forms of straw, hay, and similar materials, collecting the materials with its mouth, and making a little heap, in the centre of which it lies down. M. Buffon gives a detailed account of one of these animals, which he kept alive in his house for some time, and which was gentle and very familiar.

The flesh of these animals is in great estimation and in some districts is in ordinary consumption, but as it is fat and rich it is apt to cloy. It is prepared for cooking by being scalded like a sucking-pig and roasted. The fur is of no value, but the skin might be useful if converted into leather. M. F. Cuvier thinks that it would be possible to introduce this animal into our European rural establishments, and that once naturalised it would form no despicable acquisition in the department of domestic economy.

THE AGOUTIS

(*Dasyprocta*, Illig.; *Chlormys*, F. Cuv.).

These animals differ from the pacas in the formation of the skull and the conformation of the feet and toes. With respect to the former, the zygomatic arch presents nothing of that strange development so remarkable in the pacas. The toes are distinctly four on each of the anterior feet: of these the outermost toe on each side is small and seated high, while the two middle are long, and armed with stout claws. The hind-feet are divided into three toes, furnished with claws of a hoof-like character, and of considerable strength. The limbs are slender, and the hinder pair considerably exceed in length the anterior: hence the pace of these animals is tolerably rapid for a short distance, though they seldom trust to speed for safety, but seek shelter and security in the first hollow tree they meet with, or under a rock. Here they allow themselves to be captured without offering any resistance, only uttering a sharp plaintive note of



90.—Teeth of Agouti.

alarm. The head of the agoutis is large, the forehead convex, the nose swollen; the ears round, short, and nearly naked; the eyes large and black; the tail is very short, generally indeed a mere tubercle. The hair is glossy and of a wiry character, and annulated in different degrees with black, yellow, or white, and olive green.

The molars are $\frac{4-4}{4-4}$, nearly all of the same size, and

when worn presenting winding folds of enamel on the flat crowns. It is impossible to convey by mere description an idea of the figures which these convolutions assume, and which vary in proportion to the wearing down of the tooth: we therefore refer to Fig. 90, where *a* and *b* represent respectively the upper and lower jaws. No. 1 represents the teeth when much worn down; 2, the same in an intermediate state; 3, the same when the tubercles are just effaced, and the surface smoothed down to a level.

The flesh of the agoutis is in some districts highly esteemed, being white and tender.

The agoutis use the fore-paws as hands to convey their food to the mouth, and usually sit upright on their haunches to eat: they frequently also assume the same position in order to look around them, or when they are surprised by any unusual sound or occurrence. Their food is exclusively of a vegetable nature, and consists most commonly of wild yams, potatoes, and other tuberous roots; in the islands of the different West India groups they are particularly destructive to the sugarcane, of the roots of which they are extremely fond. The planters employ every artifice for destroying them, so that at present they have become comparatively rare in the sugar islands, though on the first settlement of the Antilles and Bahamas they are said to have swarmed in such countless multitudes as to have constituted the principal article of food for the Indians. They were the largest quadrupeds indigenous in these islands upon their first discovery. The same rule of geographical distribution holds good generally in other cases, viz. that, where groups of islands are detached at some distance from the mainland of a particular continent, the smaller species of animals are usually found spread over both, whilst the larger and more bulky are confined to the mainland alone, and are never found to be indigenous in the small insulated lands.

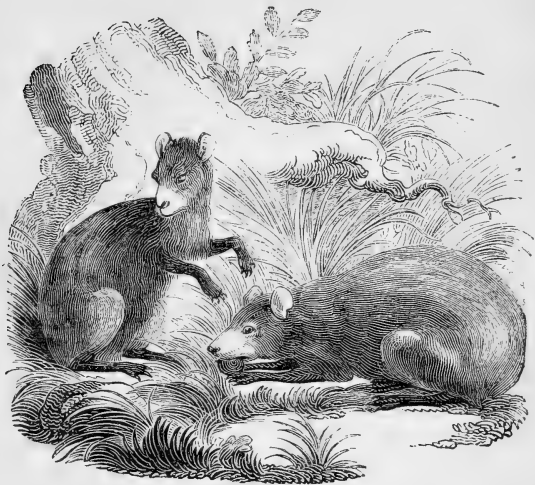
Though the agoutis use the fore-paws as described, yet they are incapable of climbing trees; and though the nails are strong, they do not burrow, but conceal

themselves in hollow trees, among fallen logs and timber in the forest, and similar places of concealment. Here they produce and rear their young, which are born with the eyes closed: they soon become capable of shifting for themselves.

THE COMMON AGOUTI (*Dasyprocta acuti*).

This species is very abundant in Brazil and Guiana, and occurs also in Paraguay, where it was observed by D'Azara, who informs us that the Guarinis term it Cotia: in size it is about equal to a rabbit, but it rarely if ever makes a burrow. It frequents densely-wooded districts in preference to open lands, and generally takes up its residence in the hollow trunks of decayed trees, where it remains concealed during the day. This retreat usually serves for several individuals, for it appears to be gregarious, associating in small troops consisting of eighteen or twenty individuals. Its movements are rapid, active, and abrupt, and when chased it bounds along, like a hare, to gain its accustomed hiding-place: it is, however, seldom seen except during the night, or as evening begins to sink into twilight. (Fig. 91.)

In Brazil and Guiana the agouti is exposed to wholesale destruction for the sake of its flesh, which is said to be intermediate in flavour between the hare and rabbit; but in Paraguay, according to D'Azara, no one eats it, and M. Moreau St. Méry observes that it has a strange sort of flavour, and is a dish of little relish to the palate. The latter writer also informs us that the agouti is common in the island of St. Lucia, and also inhabits others of the West India group; and that in 1788 several were taken in St. Domingo, which had made a hollow tree their domicile. It is said to breed several times in a year, and to produce from three to six at a birth. The general colour of the agouti is grizzled reddish brown, tinged on the neck, chest, and under surface with yellow. The hairs of the upper and fore parts of the body are annulated with brown, yellow, and black, which gives the animal a speckled yellow and green appearance on



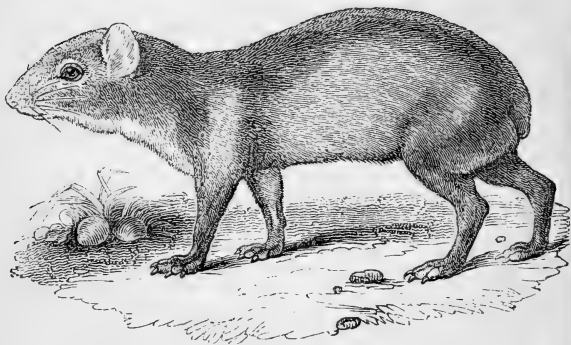
91.—Common Agouti.

the neck, head, back, and sides : on the croup, however, they are of a uniform golden yellow, much longer than on any other part of the body, and directed backwards, concealing the tail, which is a mere naked stump ; the moustaches and feet black. The general length of the hair on the upper and anterior parts of the body is about an inch, that of the croup is upwards of four inches long, and all, excepting the short coarse fur of the legs and feet, and that on the breast and belly, is of a stiff, harsh nature, partaking more of the quality of bristles than of simple hair.

The golden agouti differs from the common species principally in its brighter colouring.

THE BLACK AGOUTI (*Dasyprocta cristata*).

This species, to which the term crested (*cristata*) is ill applied (since the hairs of the head and neck are not longer than those of the shoulders), is smaller than the common species, but its general proportions and form are the same : it differs, however, in colour, for the hairs of the back and sides, instead of being annulated with various tints, as in that animal, are nearly of a uniform black, whilst the long hairs of the croup are perfectly so. A specimen we regarded as the black agouti, in the Paris Museum, might be thus described :—black, beautifully freckled with pure white, especially about the cheeks and sides, each hair on those parts being once ringed with white; length twenty inches. (Fig. 92.)

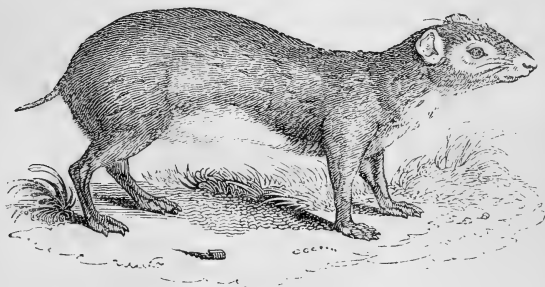


92.—Black Agouti.

THE ACOUCHI (*Dasyprocta acuchi*).

This animal differs from the agouti in being of a much smaller size, lighter make, and deeper colour, and especially in having a much longer tail, this appendage measuring two inches: it is very slender, being not much thicker than a crow-quill, and covered with short scattered

hairs. (Fig. 93.) Its manners resemble those of the agouti, and it also inhabits the woods of Guiana, but is not by any means so common as that animal. M. D'Azara was mistaken in asserting the acouchi to be identical with the agouti; and it is very obvious that he never saw the former, for, if he had, the distinction could not have escaped his notice; indeed it does not appear to be a native of Paraguay. Specimens of the acouchi, as well as its skeleton, are in the museum of the Zool. Soc.



93.—Acouchi.

Two living individuals (now the museum specimens alluded to) were described in the 'Proceeds. Zool. Soc.' 1830, by T. Bell, Esq., who obtained them from Guiana. "Both individuals," he observes, "are mild and gentle in their dispositions, but somewhat timid: they are, however, familiar with their master, and run to him whenever he enters the room in which they are kept, and about which they are allowed to range during the day. Their food is entirely vegetable; they are especially partial to nuts and almonds; they drink but very little. They are extremely cleanly, and take great pains to keep their fur in order, in cleansing which they mutually assist each other. They leap occasionally in play to a considerable height, and frequently, in springing from the

ground to an elevation of two feet, descend on the spot from which they rose. Their voice is a short, rather sharp, plaintive pur. The individuals, male and female, show great attachment to each other. They frequently agitate their tails with a quick tremulous motion." Mr. Bell observes that he had never before the arrival of these individuals seen a specimen of the acouchi, nor was he aware of the existence of even a preserved skin in any English collection. It is the Olive Cavy of Pennant. The general colour is olive mixed with yellow and black: the hairs of the croup are not so long as in the agoutis, and black.

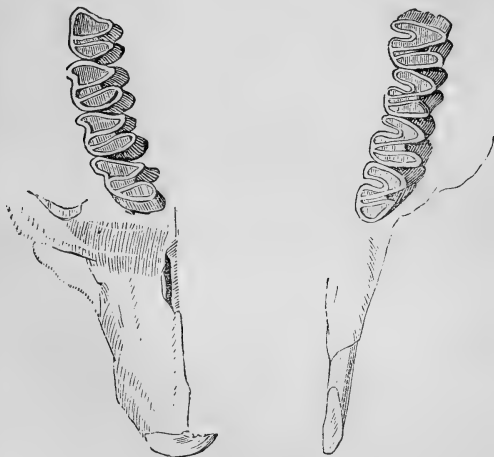
THE CAVIES (Fam. *Caviæ*)

Constitute a group (embracing the genera *Cavia*, *Dolichotis*, *Kerodon*, and *Hydrochærus*) which is one of the most distinctly marked in the class Rodentia, and which should not be confounded with that of the pacas and agoutis, the difference being very great, both as respects the conformation of the skull and the characters of the teeth. The molars, as seen in the teeth of the guinea-pig or aperea (*Cavia cobaia*), Fig. 94, and of the *kerodon*, Fig. 95, may be compared with those of the agouti, Fig. 90, and the wide distinction will be at once appreciated

The molars are $\frac{4-4}{4-4}$, lamellose, and composite; the

folds of enamel enclose triangular or cordiform interspaces. A projecting ridge always occurs on the outer side of the ramus of the lower jaw. In the genus *Cavia* the anterior feet have four toes, the posterior three; the nails are short and robust; there is no tail. As an example of this genus we may take the common guinea-pig, or aperea, the domestic descendant of a species still common in a wild state in various parts of South America. Mr. Darwin, who met with the wild aperea abundantly, states it to be "exceedingly common in the neighbourhood of the several towns which stand on the banks of the Rio Plata. It frequents different kinds of stations,

such as hedgerows made of the agave and opuntia, or sand hillocks; and again marshy places covered with aquatic plants, the latter appearing to be its favourite haunt. Where the soil is dry it makes a burrow, but where otherwise it lives concealed amidst the herbage. These animals generally come out to feed in the evening, and are then tame; but if the day be gloomy they make their appearance in the morning. They are said to be



94.—Teeth of Guinea-pig.

very injurious to young trees. An old male killed at Maldonado weighed 1 lb. 3 oz.” Mr. Darwin observed that in this animal the attachment of the fur to the skin is very slight. Possessing but little intelligence and very timid, the aperea is nevertheless tamed without any difficulty. Azara, who kept one, remarks that, though he took no pains to make it familiar, it manifested no fear when in his presence, and seemed quite unconcerned.

It is to this ease with which the wild aperea becomes domesticated that we owe the introduction of it into Europe, for, excepting that it is a very pretty creature, there is nothing to render it a valuable acquisition. It



95.—Teeth of Kerodon.

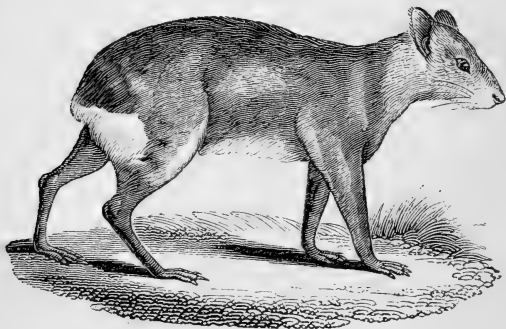
is however eaten by the native tribes of Paraguay, who sometimes capture it by hundreds when, driven from the lowlands by sudden inundations, it retreats for safety to the adjacent hilly grounds, where it finds neither shelter nor concealment.

Of the genus *Kerodon* we may notice the Rock Kerodon (*Kerodon moco*, F. Cuv.; *Cavia rupestris*, Pr. Max.). It is a native of the rocky mountain districts in the interior of Brazil. It is less than the aperea, and its fur is very thick and short. The colour is gray mixed with black, and reddish-brown above, the under parts being white. A second species, King's Kerodon (*Kerodon Kingii*), was introduced to science by the late Mr. Bennett. It was found by Captain King at Port Desire, on the eastern coast of Patagonia. In size it is less than the aperea, being about nine inches long. Its colour is more uniform than that of the rocky kerodon, and of a deeper tint; a slight dash of white is perceptible behind each ear, and a line of the same tint marks the edge of each branch of the lower jaw. Mr. Darwin states that this kerodon "is common at intervals along the coast of Patagonia, from the Rio Negro (lat. 41°) to the Straits of Magellan. It is very tame, and commonly feeds by day. It is said to bring forth two young ones at a birth. At the Rio Negro it frequents in great numbers the bottom of old hedges. At Port Desire it lives beneath the ruins of the old Spanish Buildings. At the Strait of Magellan I have seen amongst the Patagonian Indians cloaks for small children made with the skins of this little animal. And the Jesuit Falkner says that the people of one of the southern tribes take their name from the number of these animals which inhabit their country. The Spaniards and half-civilized Indians call the kerodon 'conejos,' or rabbit, and thus has the mistake arisen that rabbits are found in the neighbourhood of the Straits of Magellan."

THE PATAGONIAN CAVY, OR MARA

(*Dolichotis Patachonica*, Desm.; *Cavia Patachonica*, Shaw).

This large cavy is rare in European museums. A fine specimen, however, is preserved in the British Museum and the Museum of the Zoological Society. It is a beautiful animal, standing high on the legs, with much of the port of some of the bush antelopes of Africa. Its height at the shoulder is about a foot and a half. Its length is about two feet six inches, including the tail, which is nearly two inches long. (Fig. 96.) It lives



96.—Patagonian Cavy.

on the Pampas south of Buenos Ayres, and especially in Patagonia. It is noticed by Narborough, Wood, and Byron as being very abundant at Port Desire, and also at Port St. Julian, where, however, it does not now appear to exist. It is only where the country has a desert character that this species is common; and in the wilds of Patagonia little groups of two, three, or four may be continually seen hopping after each other in a straight

line, over plains of gravel thinly clothed with a few thorny dreary bushes and a withered herbage.

According to Azara, this cavy does not range higher north than latitude 35° : but in this statement he appears to be mistaken, for Mr. Darwin observed that near the coast of the Atlantic its northern limit is formed by the Sierra Tapalguen, in latitude $37^{\circ} 30'$, where the plains rather suddenly become greener and more humid; and he remarks that its limit there certainly depends on this change, since near Mendoza, $33^{\circ} 30'$, four degrees farther northward, where the country is very sterile, this animal again occurs. Azara states that this cavy never excavates its own burrow, but always uses that of the viscacha or biscacha; and Mr. Darwin considers that where that animal is present Azara's statement is doubtless correct, but that on the sandy plains of Bahia Blanca, where the biscacha is not found, this cavy, as the Spaniards maintain, is its own workman. The same thing, he adds, occurs with the little owls of the Pampas (*noctua cunicularia*), which have been described by travellers as standing like sentinels at the mouth of almost every burrow; for in Banda Oriental, owing to the absence of the biscacha, these birds are obliged to hollow out their own habitations. Azara moreover states that, except when pressed by danger, this cavy does not have recourse to its burrow for safety, but crouches on the plains, or trusts to its speed; adding, however, that it is soon run down. On the contrary, Mr. Darwin asserts that at Bahia Blanca he repeatedly saw two or three animals sitting on their haunches by the mouths of their holes, which they quietly entered as he passed by at a distance. He remarks, however, that, different from most burrowing animals, they wander, commonly two or three together, to miles or even leagues from their home, and he was not able to ascertain whether or not they returned at night. This species is diurnal in its habits, roaming about by day. It is very shy and watchful, seldom squats after the manner of a hare, and cannot run fast, so that indifferent dogs easily overtake it. The female breeds in her burrow, generally producing two

young ones at a birth. The flesh of this animal is white, but dry and insipid. The skin with the fur on is in esteem, being used for rugs, and is beautiful from the character of the hair, which is full and soft, and from the tasteful arrangement of the marking. The colour of the back is brown, grizzled with white, verging into yellow on the sides of the body and on the limbs, but becoming black as it approaches the haunch: this dark hue is there abruptly interrupted by a white band passing transversely above the root of the tail, and spreading on the back and sides of the thighs. The appearance of this white mark is very striking. The chest, inside of the limbs, and under part of the body are also white. The ears are three inches and a half in length, erect and pointed. Full-grown individuals weigh between twenty and twenty-six pounds. The young, it is said, may be easily domesticated.

THE CAPYBARA

(*Hydrochærus Capybara*; *Cabiai*, Buff.).

The capybara (the only known species of the genus *Hydrochærus*) is the largest of all the Rodentia; and its size, its massive heavy proportions, its thick head, and the bristly character of its hair, give it a degree of resemblance to some of the Pachydermata. Marcgrave regards it as a sort of aquatic hog; Fermins, in his 'History of Surinam,' 1775, terms it *Porcus fluviatilis*, or river-hog; while Pennant gives it the title of thick-nosed tapir. It is also the cochon d'eau of Desmarchais; the *Sus maximus palustris* of Barrère; and the *Sus hydrochærus*. Pig-like as the capybara may be in its external aspect, it is nevertheless a genuine Rodent, as much so as the hare or agouti. Its dentition consists of the usual incisors, which are of prodigious size and strength; those in the upper jaw have a deep longitudinal furrow on their outer surface. The molars are four on each side, above and below; and consist of a series of obliquely transverse parallel laminæ of enamel (Fig. 97), presenting acute lateral projections in the first three teeth: these projections are on the outer edge



97.—Teeth of Capybara.

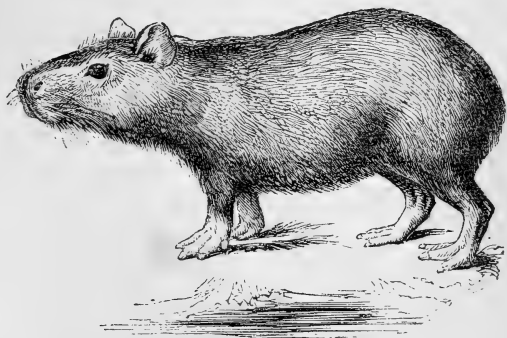
of the upper teeth and the inner edge of the lower. The spaces enclosed by the layers of enamel are filled in with osseous matter, and the whole is united into a single mass by intervening cortical matter, or *crusta petrosa*. The molars of the capybara are in fact analogous to those of the elephant.

We have stated that in some Rodents the fauces, or back of the mouth, is continued funnel-shaped, opening

into the œsophagus through a small orifice surrounded by a muscle of circular fibres, allowing only the gradual transmission of food which has been previously reduced to a thorough pulp. This structural peculiarity was first pointed out in the capybara by Mr. Morgan ('Linn. Trans.' vol. xvi.), but we meet with it also in the coypu, the capromys, and the beaver. (See 'Proc. Zool. Soc.,' 1832, p. 73; 1835, p. 175.) In the capybara the head is large, the muzzle thick and blunt, the upper lip deeply fissured; the eyes are moderately large; the ears small and rounded. The naked patch of the size of half a crown occupies the cheek a little below each eye. The fore-limbs are short and muscular, the toes being four, furnished with strong claws; the hind-limbs are also thick, but longer than those before, and the whole of the sole, which is covered with naked rough skin, is applied to the ground. The toes are three in number, having strong large hoof-like nails, and being partially connected together by intervening membranes. The tail, a mere rudiment, is scarcely to be perceived. This animal exceeds three feet six inches in length, and its body, which is more than three feet in girth, owing to its bulk and the shortness of the limbs, almost touches the ground. It is covered with long, coarse, thinly-set hairs of a sandy or brownish gray. (Fig. 98.) A fine specimen, recently living, is preserved in the Museum of the Zoological Society.

The capybara is a gregarious animal, frequenting the rich and wooded borders of the lakes and rivers in Brazil, Guiana, and Paraguay. Mr. Darwin states that it is common, wherever there are large rivers or lakes, over that part of the South American continent which lies between the Orinoco and the Plata, a distance of nearly 1400 miles. They are not generally supposed to extend south of the Plata, but he heard that there were capybaras (provincially termed *Laguna carpincho*) high up the Salado, and presumes that they have sometimes been seen south of the former river. This animal lives usually in small companies, which remain concealed among the thickets and dense herbage of the borders of

the water during the day, and wander forth at night to feed. When alarmed, the capybara utters a loud cry like the vowel sounds *a-pé*, and immediately makes for the water, into which it plunges, swimming with great ease and quickness, little more than its nose appearing above the surface. If hard pressed or wounded, it dives in order to baffle its pursuers, and then endeavours to gain a more secure place of concealment. It is eagerly hunted for the sake of its flesh, which is accounted good, though of a musky flavour: the hind quarters are made into hams. Of its natural enemies the terrible jaguar is the most for-



98.—Capybara.

midable: this powerful beast steals upon the capybara by surprise, and destroys numbers. The food of the capybara consists exclusively of grass and vegetables, as water-melons, gourds, &c. Azara does not believe that these animals ever frequent salt-water: Mr. Darwin shot one in the bay of Monte Video, an old female, measuring, from the tip of the snout to the end of the stump-like tail, three feet eight and a half inches, in girth three feet two inches, and weighing 98 lbs. Several also were seen by the officers of the *Beagle* on the island of Guritti,

off Maldonado, where the water is nearly as salt as in the sea.

On the banks of the Apure Humboldt saw the capybara, which he calls Chiguira, in troops of fifty or sixty. He notices the ease of the capybara in the water; and states that he saw with surprise the animals, affrighted by the approach of a boat, dive and remain from eight to ten minutes under water. On the Apure, Arauco, &c., and in the vast savannahs of the Llanos, the animal is said to be often seen in droves of a hundred. They there browse upon a sort of grass called chiguirirero.

The common posture of the capybara when at rest is sitting upon the haunches, the soles of the hind-feet being applied flat to the ground, like the agouti, the viscacha, and many others of the Rodents. The female breeds once in a year, and brings forth from four to six or seven at a birth, having prepared a snug bed of dried herbs and grasses.

FAMILY—LEPORIDÆ.

THE family *Leporidae* contains the hares and rabbits (*Lepus*), and the pikas (*Lagomys*). This family is well marked in its characters, comprehending only two genera, of which one, the genus *Lepus*, is widely distributed, though it has the most representatives in North America, where the number of species already discovered is equal to that of all the rest found in the other portions of the globe taken together.

THE COMMON HARE (*Lepus timidus*).

Λαγὼς (*Lagos*) of the Greeks; *Lepus* of the Latins; *Lepre* and *Lievora* of the modern Italians; *Liebre* and *Lebratello* of the Spaniards; *Lebre* and *Lebrimho* of the Portuguese; *Lièvre*, French; *Has*, *Haas*, and *Hase* of the Germans; *Haas* and *Haze* of the Danes; *Hara* of the Swedes; *Hara* of the Anglo-Saxons; *Ysgyfarnog* *Ceinach* of the Ancient British.

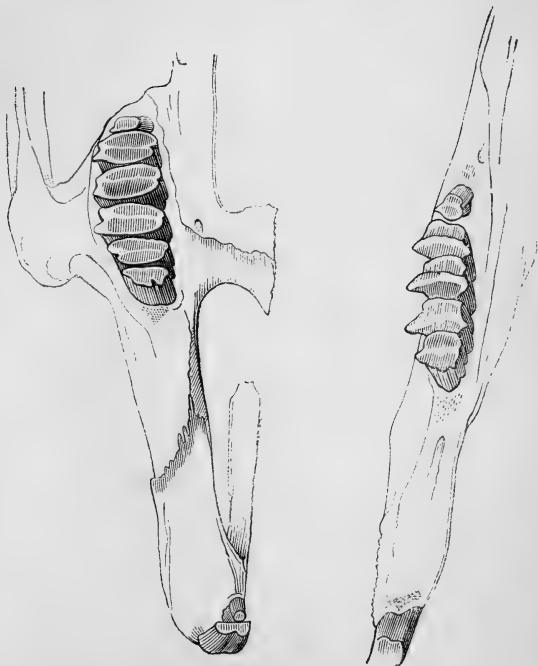
In the genus *Lepus*, behind the ordinary incisors of the upper jaw are two more of a much smaller size: the

molars, the small posterior one excepted, are composed of two vertical plates soldered together. Dental formula :

—Incisors, $\frac{4}{2}$; molars, $\frac{6-6}{5-5}$. (Fig. 99.) The ears are

long ; the eyes large ; the tail short and turned upwards ; five toes before, four behind ; feet and toes hairy beneath.

Few animals are better known than our common hare,



99.—Teeth of Common Hare.

which is spread over a great portion of Europe, and appears to be indigenous in our country ; but the ancient Britons abstained from eating its flesh on religious grounds. This species probably extends into Asia. Mr. M'Clelland states that it occurs in Assam, but is of degenerate size, measuring only from seventeen to nineteen inches, instead of twenty-one. "It is not esteemed there an article of food. The ears are more uniformly gray than in the European variety" ('Proc. Zool. Soc.,' 1839). We suspect the Assam hare to be a distinct species. Timid and defenceless, and surrounded by numerous enemies, the hare is yet well endowed with the means of self-preservation. It is watchful and swift ; and its brown fur assimilates in colour with the russet herbage among which it most makes its form. All are acquainted with the external characters of the hare, and with its habits, of which it is useless to give minute details.

The hare swims well, and takes fearlessly to the water. We have known them cross a broad and rapid stream ; and Mr. Yarrold (see 'Loudon's Magazine,' vol. v.) gives an account of one which in the morning at high water came down to the sea-shore, and crossed over to an island a mile distant from the mainland.

Wild and timid as the hare is, it is not unsusceptible of domestication. The poet Cowper, as is well known, kept tame hares ; and many other instances might be enumerated.

The hare breeds when about a year old, and produces two or three broods in the course of the spring and summer ; but the males and females do not form permanent associations. The female, after about thirty days' gestation, brings forth from three to five young. These are born covered with fur, and with the eyes open ; and in about a month they leave their parent and shift for themselves. The leverets, as the young are termed, are the prey of stoats, weasels, polecats, owls, and hawks.

Besides the common hare, the Alpine or varying hare inhabits certain districts of our island, namely, the northern parts of Scotland. This species (*Lepus variabilis*) is common in the mountain districts of Sweden,

Norway, Lapland, and in the Alps. It is occasionally seen on the mountains of Cumberland.

The Alpine hare is intermediate in size between the rabbit and the English hare. In Sutherlandshire and other parts of the Scottish highlands it tenants the summits of the mountains, hiding in the clefts of rocks or among rocky fragments. During the winter lichen is its staple food. At this season it descends to a lower and less exposed station; and its fur, gradually losing the light fulvous gray of summer, becomes of a snowy white, the tips of its ears (which are shorter than the head) remaining black.

The common hare of Ireland (*Lepus Hibernicus*) is again distinct from the common hare of England. The distinguishing characters between the two were first pointed out by Mr. Yarrell. (See 'Proc. Zool. Soc.' 1833, p. 88.)

Though somewhat larger than the English species, its head is shorter and more rounded, its ears still shorter than its head, and its limbs less lengthened. The fur also differs greatly in its quality from that of our common hare, and is useless as an article of trade.

THE RABBIT (*Lepus Cuniculus*).

Coney, Anglicè; Coneiglio of the Italians; Conejo, Spanish; Coelho, Portuguese; Königlein and Kaninchen, German; Konin, Dutch; Kanin, Swedish; Kanine, Danish; and Cwningen of the Welsh.

Size excepted, the rabbit closely resembles the hare in all its principal characters. It may, however, be at once distinguished by the comparative shortness of the head and ears, as well as of the hinder limbs; the absence of a black tip to the ears; and by the brown colour of the upper surface of the tail. Its habits and general economy are totally opposite to those of the hare; and its flesh, instead of being dark and highly flavoured, is white, and, though delicate, somewhat insipid, especially that of the tame breed. The flesh of the latter is indeed

preferred by some, but we agree with M. Ude in thinking it very inferior.

It would appear that the rabbit is not an aboriginal of our island, but the date of its introduction is unknown. In the year 1309, at the installation feast of the Abbot of St. Austin's, six hundred of these animals were provided, at the then great cost of 15*l.*; the price of each, sixpence, being that of a pig. It is generally believed that the rabbit was first introduced into Spain from Africa by the Romans, whence it gradually spread, naturalising itself in temperate climates.

This animal is eminently gregarious; and, as is well known, makes extensive burrows, in which it habitually dwells and rears its young. Sandy soils, with a superficial layer of fine vegetable mould clothed with thyme, fine grass, and other herbage, which at the same time afford food and are easily mined, are favourable spots for the increase of the rabbit. They delight in steep sandbanks overhung with brushwood and furze; and we have remarked that where the old red sandstone crops out and is rendered friable, or somewhat decomposed by the action of the atmospheric elements, rabbits are very numerous, burrowing with great facility. They abound also in woods, especially such as clothe the declivities of hills, whence, like the hare, they make incursions into the adjacent corn-lands. A rabbit-warren, that is, a wide sandy heath, or extensive common, devoted to their increase and feeding, when visited at the close of day or by moonlight, affords an amusing spectacle. Hundreds may be seen of all sizes, gambolling and sporting, and chasing each other with astonishing rapidity. When alarmed, they take to their burrows, disappearing as if by magic.

The female is capable of breeding at six months old; and four or five litters, consisting each of about five young, are annually produced. We have stated that the hare produces her young clothed, capable of seeing, and soon in a condition to shift for themselves. With the rabbit circumstances are widely different. The young are born blind, and naked, and totally helpless. The

female forms a separate burrow, at the bottom of which she makes a nest of dried grass, lining it with fur taken from her own body. In this nest she deposits her young, carefully covering them over every time she leaves them. It is not until the tenth or twelfth day that the young are able to see; nor do they leave the burrow till four or five weeks old.

The wild rabbit is undoubtedly the origin of our various domestic breeds. Tame rabbits indeed easily resume their natural state of freedom, and return to their instinctive habits. Albinoes are common in a state of domestication, and it often happens that one or two appear in a litter when neither of the parents are so.

THE SYRIAN HARE.

According to Desmarest, the common hare of Europe exists in Greece, Asia Minor, and Syria. It is, however, very probable that the Egyptian hare (*Lepus Ægyptius*) extends into the latter region. It differs from the European species principally in the greater proportionate length of its hind limbs and ears.

THE DWARF PIKA (*Lagomys pusillus*).

The Calling-Hare of Pennant; Semlanoi Saetshik, or Ground Hare, of the Russians about the Volga; Tschatschat or Ittsitskan, Barking Mouse, of the Tartars; Rusla of the Calmucs.

In the genus *Lagomys* the muzzle is acute, the ears short and somewhat rounded, and the soles of the feet hairy; the tail is wanting. The dental formula ap-

proaches that of the genus *Lepus*:—Incisors, $\frac{4}{2}$; molars, $\frac{5-5}{5-5}$.

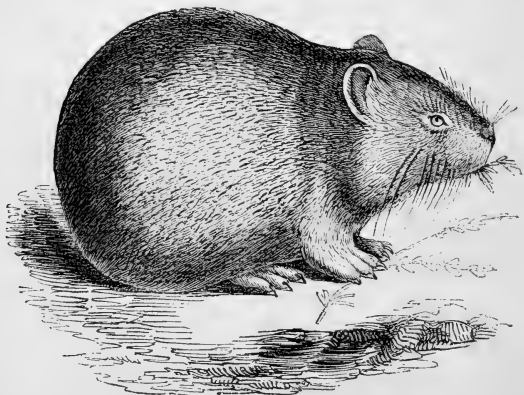
The genus *Lagomys* is widely distributed, though the species described are not numerous. About five are known, and of these three are natives of the rocky deserts of Tartary and Siberia; the fourth is a native of the Himalaya Mountains; a fifth of the Rocky Moun-

tains in the high northern regions of America, from latitude 52° to 60° .

The pikas are pretty little animals, with something of the manners of our rabbits, and dwell in burrows, which are artfully concealed.

The dwarf pika, or calling-hare, measures little more than six inches in total length. It has the head longer than usual with hares, and thickly covered with fur, even to the tip of the nose; numerous hairs in the whiskers; ears large and rounded; legs very short; soles furred beneath; its whole coat very soft, long, and smooth, with a thick, long, fine down beneath, of a brownish lead-colour; the hairs of the same colour, towards the ends of a light gray, and tipped with black; the lower part of the body hoary; the sides and ends of the fur yellowish. Weight from three and a quarter to four and a half ounces; in winter scarcely two and a half ounces. (Fig. 100.)

The dwarf pika, or calling-hare, is found in the south-east parts of Russia, and about the mountain ridge



100.—Dwarf Pika.

spreading from the Ural chain to the south ; it also frequents the borders of the Irtish and the west part of the Altaic chain, but occurs nowhere in the east beyond the Oby.

These animals delight in sunny valleys and the declivities of hills, where food is plentiful, and especially where woods or forests afford them a refuge in time of danger. They dig deep and intricate burrows, the openings of which are not above two inches in diameter, and are usually formed beneath the concealment of a bush, in situations abounding with thickets and underwood, and with the various shrubs and grasses upon which they feed. They lead for the most part a solitary life, sleep during the day with unclosed eyelids, like the hare, and emerge from their retreats at night, in search of food, which principally consists of the bark of the young bushes, flowers, buds, and grass. They form no winter store, but, during the inclement portion of the year, still continue to seek out, by excavating tracks beneath the snow, their accustomed fare, and they are frequently subjected to severe privations, and even death, in consequence of a deficiency of their favourite plants. They drink often when they happen to be near water, but can exist with very little. The females produce at each litter five or six young, which are born blind, helpless, and without fur ; but in eight days they acquire sight, are covered with hair, and begin to enjoy the use of their limbs.

The most obvious peculiarity of these pikas is their voice, from which they have acquired their trivial name. Its tone is so like that of a quail, that it is often mistaken for it even by the inhabitants of their native districts. It is heard only in the morning and evening, except in dark and cloudy weather, and is repeated five or six times by each animal at regular intervals, and is loud and sonorous. Both the male and female utter this note, but the latter is silent for some time after she has brought forth her young, which takes place in the month of May.

The pikas are exceedingly gentle. Pallas states that

they will acquire confidence and become tame in the course of a day after captivity. They sit in a crouching posture, like the chinchilla, and are extremely cleanly, frequently rubbing their faces with their fore-paws after the manner of rabbits, and scratching their fur with their hinder claws. They run by short leaps; and sleep stretched out at full length.

ORDER EDENTATA, CUV.

(*Bruta*, Linn.).

THIS order, which contains the Sloths, the extinct Megatherium and Mylodon, the Armadillo, the Pangolin, and the Ant-eater, appears at a first glance to be less natural than upon careful analysis it is proved to be. Several important links indeed, the absence of which left voids in the chain, have fortunately been recovered, their fossil relics restored, and the species assigned to their true place. In this philosophic labour Professor Owen has rendered to science the most important service, and his work, entitled 'A Description of the Skeleton of an extinct gigantic Sloth,' but which is in fact an elaborate analysis of the structure and affinities of the megatherioid quadrupeds in general, is a monument of research and acumen.

With respect to the term Edentata (toothless animals), it must be taken in a qualified sense. The ant-eaters and pangolins are indeed destitute of teeth, but the other genera possess these organs with certain limitations as to number, and of peculiar structure, wanting both the neck part and enamel. Without further preface we may observe that the Edentata resolve themselves into two great sections, namely, Leaf-eaters, and Insect or Flesh eaters. These sections, from their respective habits, have been termed by Desmarest *Tardigrada*, or slow-paced, and *Effodientia*, or diggers: but to these terms, as they are not universally applicable to the species they include, there are some objections.

SECTION I. LEAF-EATERS.

FAMILY—SLOTHS

(*Tardigrada*, Owen; *Bradypodidæ*, Auct.).

Genus *Bradypus*, Linn. (*Acheus*, F. Cuv.)—Claws on the fore-feet, three.

THE COMMON SLOTH, OR Aİ

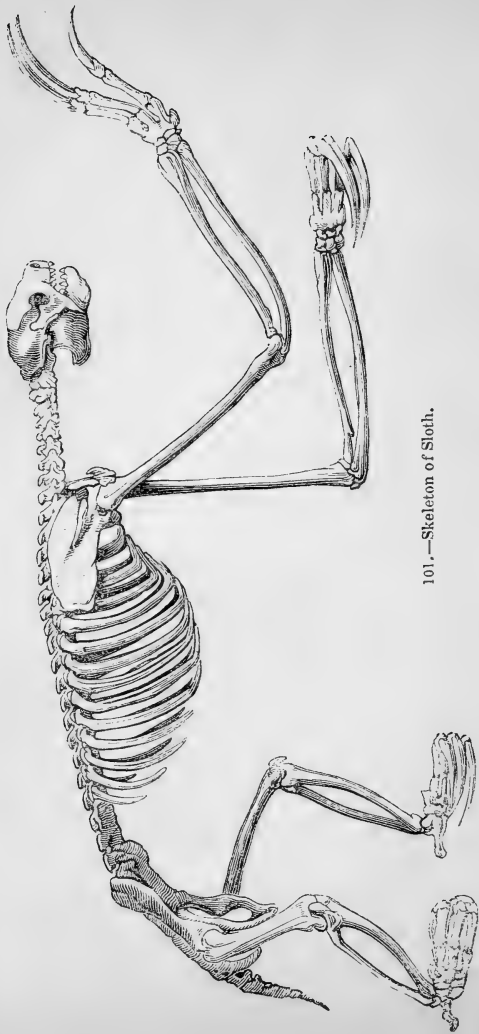
(*Bradypus tridactylus*, Linn.).

The Sloths are creatures as extraordinary in their habits as in their organization, the one having a mutual relationship to the other. They are exclusively arbooreal; the trees afford them at once their needful food and their permanent abiding-place: and for the trees alone are they structurally adapted. It is not long since that the sloth was condemned as a degraded miserable being, slow and embarrassed in all its movements, and wretchedly framed, as if Nature had bungled in its creation. Inconsistent with philosophy, and presumptuous in the extreme, is such an opinion. The tall giraffe and the sinewy-limbed antelope are not more directly organized for their respective requirements than is the sloth for its appointed place in the scale of creation. Were it a terrestrial animal, then indeed might we call its structure defective; but, its mode of life taken into consideration, we view it in another light, and perceive that it affords a marked example of design and purpose.

Buffon's eloquent misrepresentation of the sloth need not detain us, but we cannot avoid expressing our surprise that the great Cuvier not only quotes the words of that naturalist, but even follows up his ideas. The only excuse is, that the habits of the animals till recently were very imperfectly understood; yet might we not expect that a philosopher would pause before concluding that in the works of nature there occurred exceptions to the laws of harmony by which the whole is governed?

A few observations on the organization of the sloth may not be unacceptable.

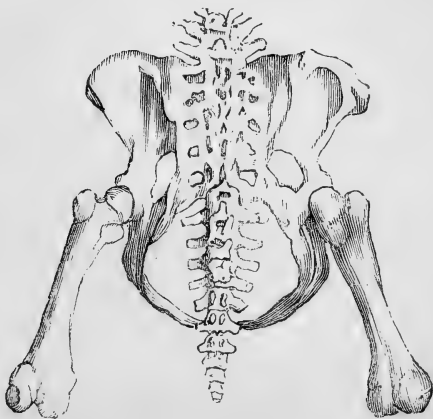
Fig. 101 represents the skeleton of the common three-



101.—Skeleton of Sloth.

toed sloth; Fig. 102 the pelvis of the same; Fig 103 the skeleton of the unau, or two-toed sloth.

In the skeleton of the sloth we are struck at once with the great length of the fore limbs, which are twice as long as the hinder pair, and with the huge hook-like claws by which all four are terminated: we perceive, too, that the pelvis is bird-like in its conformation and of great breadth, separating the thigh-bones to an unusual distance from each other; added to this, the thigh-bones are directed obliquely outwards, while the limb from the knee downwards has an inward inclination; and the structure of the wrist and ankle is such that the palm or sole, instead of being directed to the surface of the ground, as in other animals, is turned inwards towards the body in such a manner as to render it impossible for the sloth to place the sole of its foot straight down on a level surface, but to compel it under such circumstances to rest upon the external edge of the foot (see skeleton, Fig. 101). The hip-joint, as in the orang-outan, is



102.—Pelvis of Sloth.



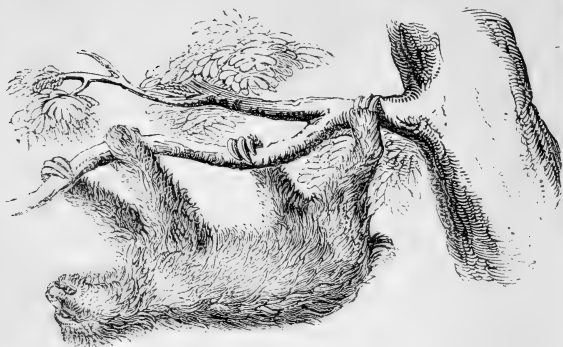
103. —Skeleton of Unau.

destitute of the ligamentum teres, whence the head of the thigh-bone is endowed with greater freedom of motion. In the *ai* (three-toed sloth) the neck consists of nine vertebræ, instead of seven, the ordinary number in mammalia, and the two tables of the skull in all the species are separated by large air-cells, so that the small bird-like brain is defended by a double case, a provision against accidental falls, should the branch to which the animal is clinging give way.

Professor Owen observes, respecting the sloths, that “they illustrate the affinity or tendency to the oviparous type, by the supernumerary cervical vertebræ, supporting false ribs, and by the convolution of the windpipe in the thorax, in the three-toed species; by the lacertine (lizard-like) character of three-and-twenty pairs of ribs in the *unau*; and by the low cerebral development, by the great tenacity of life, and long-enduring irritability of muscular fibre in both species.” The muscles of the

sloth, indeed, are endowed with the most astonishing energy ; their force is, indeed, almost incredible, and harmonizes with the arboreal design of the skeleton, of which the limbs alone sufficiently indicate the creature's habits. Who can mistake the meaning of the solid hook-like structure of the paws, or the design of the long arms, or of the security of the union of the clavicle to the large scapula? We might here enter into minute details, but we refrain, only observing that Nature in these points aimed at rigid unyielding strength, and has obtained the result she wished ; the long arms of the sloth being thus furnished with strong hooks, which are drawn to the palm (and the same observation applies to the claws of the hind-feet) by means of elastic





105.—Sloth : mode of progression.

ligaments, it can reach to a distant branch, and there fix itself with facility, or, while clinging to one branch, can draw towards itself another loaded with buds, fruits, or leaves, which offer a grateful repast. (Fig. 104.) Rigid as its paw is, it can use it as a hand, and with great address convey food to its mouth.

Unfitted then for the ground, along which he can only drag himself by applying the claws of the fore-feet to any rough projection within reach, the sloth is eminently qualified for the branches of the forest, and that rather for their upper than their under surface ; clinging to them, he rests and travels suspended, yet in perfect security ; here his awkwardness disappears, and he traverses the branches or passes from tree to tree in the dense forest with considerable celerity, either in quest of food or in order to escape his enemies. Stedman, in his 'History of Surinam,' has an engraving of a sloth in this position, which we have copied as illustrating its singular mode of progression. (Fig. 105.) But the arms of the sloth are also his weapons of defence, and weapons of no little force : when attacked on the ground, he throws himself on his back, fixes his claws on his adversary, and grasps him with enormous power ; in this manner he has

been known to strangle a dog, holding him all the while at arm's length; and in this manner he grapples with snakes of large size, to the attacks of which he is said to be subject.

Mr. Burchell (says Professor Buckland, in an interesting paper on these animals in the 'Linn. Trans.' 1835) observed that "his captive sloths assumed during sleep a position of perfect ease and safety on the fork of a tree, their arms embracing the trunk, their backs resting on the angle of a branch, and their head reclining on their own bosom. The animal is thus rolled up nearly in the form of a ball; the entire vertebral column, including the neck, assumes a nearly circular curve, and not only is the weight of the whole body maintained in an attitude of ease and safety, but the head is supported between the arms and chest, and the face lies buried in the long wool which covers those parts, and is thus protected during sleep from the myriads of insects which would otherwise attack it." According to Mr. Burchell, the buds and young shoots of a species of *Cecropia* form the principal food of the sloth. These trees grow only in damp places, and rise with a slender stem to the height of thirty or forty feet, giving off horizontal branches, hollow internally, except at the extremities. Along these branches it travels, and the young cling round the body of the mother. It would appear that the moisture of leaves or buds suffices the sloth for drink, as none kept by Mr. Burchell took liquid in any other way. In the aspect of the sloth there is an expression of profound melancholy; it seldom utters any cry; it notices nothing with any positive mark of attention, except perhaps the trees to which unerring instinct draws it, nor by any action evinces much intelligence.

The dental system of the sloths is the most simple that can well be conceived. They have no incisor teeth, but canines and molars only; and in the ai the canines are diminutive, and in all respects very similar to the other teeth. The molar teeth are universally eight in the upper jaw and six in the lower, four and three on either side respectively. Their construction is most

simple; they are cylindrical, unrooted, consisting, as Professor Owen has demonstrated, of a centre of vascular dentine surrounded by unvascular dentine or ivory, the whole enveloped by a layer of cœmentum, characterised by numerous minute calciferous cells. Ill fitted for grinding the food, the teeth merely bruise it or break down the tender structure of the buds or leaves, their deficiency in this point being most probably compensated by the singular complication of the stomach, which is sacculated.

The sloths bring forth and suckle their young like ordinary quadrupeds. They have two mammæ, which are situated on the breast; and the young sloth, from the moment of its birth, adheres to the body of its parent till it acquires sufficient size and strength to shift for itself. The head of the *aï* is short, the face small and round like that of the American monkeys, the ears concealed in the long hair which surrounds them, the eyes small and deeply sunk in the head, and the tail a mere rudiment. The Indians like its flesh, and are in continual pursuit of it.

Naturalists reckon two distinct species of the *aï*, and three or four varieties, some of which may probably be found to be specifically different, when they come to be dissected and carefully compared with one another. 1. The Common *Aï* (*Bradypus tridactylus*, Linn.) has a short round head, furnished with coarse shaggy hair, disposed on the crown in verging rays, like that of the human species; the face is of a yellowish colour, covered with very short hair, whilst that of the body and extremities is universally long and shaggy; the eyes are encircled by a brown ring; the hair of the body varied with irregular patches of dark and light brown, or silvery white: between the shoulders there is an oval patch of short orange-coloured hair, of a finer quality than that found on other parts of the body, and divided in the centre by a longitudinal black stripe; the throat and breast are frequently of a light straw-colour. The texture of the hair is altogether peculiar, and more nearly resembles dry hay, or grass shrivelled and withered by the sun,

than the hair of ordinary quadrupeds. It is coarse and flattened at the extremity, but as small at the root as the finest spider's web; and its dry and withered appearance forms the aï's principal security against its pursuers, as it renders it extremely difficult to detect it whilst at rest among the branches covered with bark and moss of the same colour; it is only when in motion that it can be readily distinguished from the trunk beneath which it hangs suspended. In other respects, different individuals of this species differ considerably from one another, in the shade and disposition of their colours, and in the intensity of the mark between the shoulders; some even want this latter mark altogether, others are of a uniform ash-colour over the whole body, and there are others still which have the hair of the head parted in the centre and hanging down upon each side.

Length of the adult about seventeen or eighteen inches.

The Collared Aï (*Bradypus collaris*) is a very distinct species, even in the bony structure of its cranium. Its face is naked and of a black colour; the hair of its body less flattened and withered-looking than in the common species; the forehead, temples, chin, throat, and breast covered with reddish or rust-coloured hair, slightly frizzled; on the crown of the head it is long and yellow, and on the rest of the body pale orange: but the most distinguishing mark of the species is a large black collar which completely surrounds the neck, and from which its specific name of *collaris* is derived. Beneath this outer coat there is an inner one of very fine fur, which is of a dark-brown colour on the collar, but gradually diminishes in intensity towards the croup, where it is entirely white.

Both these species feed upon the leaves of trees, and bring forth but a single young one at a birth. When in motion in the forests, they emit a feeble plaintive cry, resembling the word Aï, and which is the origin of the name they bear among the Europeans settled in America. They are extremely retentive of life, and have been seen to move their legs, and exhibit other symptoms of viva-

city, a full half-hour after being deprived of the heart and other viscera.

The Unau, or two-toed sloth, of which we figure the skeleton (Fig. 103), is placed by Illiger in a distinct genus, under the title of *Cholæpus*. It is the *Bradypus didactylus* of Linnæus. In its manners it closely resembles the *ai*, which it exceeds in size.

In both genera the skull is rounded, and the muzzle short, but more especially in the *ais*. The zygomatic arch is very bold and stout, but is incomplete in the centre. The malar bone is much developed, and gives off a descending branch reaching over the lower jaw, but its zygomatic process does not reach the corresponding process of the temporal bone; hence the arch, as we have said, is imperfect. The orbits are nearly circular, but incomplete behind. The lower jaw is large and strong.

In the two-toed sloth there are no pro-dorsal or supernumerary vertebræ in the neck; the feet are far less universally consolidated together.

FAMILY—GRAVIGRADA, Owen.

FEET short, very strong, equal or subequal; fore-feet with five or four toes, of which one or two of the outermost are unarmed, fit for support and progression; the rest are armed with huge claws. Zygomatic arch complete, clavicles perfect; tail moderate or stout, acting as a fulcrum or prop.

Such are the characters of this family, as laid down by Professor Owen. It contains the following genera:—*Megalonyx*, *Megatherium*, *Myodon*, *Scelidotherium*, *Cælodon*, and *Sphenodon*; of these genera all the species are extinct, and only known from their fossil relics.

MYLODON ROBUSTUS.

From the skeleton of this extinct giant, now preserved in the Royal College of Surgeons, we see that, except that it was formed for tearing down the trees of the forest, and not living in their branches, it was closely

related to the comparatively pigmy sloths of the present day. Conceive of a sloth of the size and bulk of a rhinoceros or hippopotamus, but with bones infinitely more massive, muscles infinitely more voluminous and powerful, with a thick tail acting as a support, and forming with the hind-limbs a firm tripod, while the animal, thus raised upright, and exerting its enormous strength, sways the tree to and fro, and lays it at last prostrate;—and our reader will have a good idea of what this mighty devastator of the primitive forests of South America must have been.

The skeleton in question was discovered, as we are informed by Professor Owen, “in the year 1841 by M. Pedro de Angelis, seven leagues north of the city of Buenos Ayres, in the fluvial deposits constituting the extensive plain intersected by the great Rio Plata and its tributaries, and which has been raised during a recent geological epoch above the level of the sea.

“In this formation, and most probably anterior to its elevation, the animal must have been buried entire, and, if the present heat of the climate prevailed, soon after its death, for the parts of the skeleton were found little disturbed, and the very few bones that are wanting are such as would be likely to escape the search of the most diligent collector.

“About the same time and near the same place a tessellated osseous carapace of some large quadruped like an armadillo was exhumed, and information of this discovery having been communicated to the Royal College of Surgeons by Sir Woodbine Parish, late Her Majesty’s Chargé d’Affaires at Buenos Ayres, both this carapace and the above-mentioned skeleton were purchased by the College. They arrived in November, 1841, in many pieces, fragile from the loss of the animal matter; but having been restored in some measure to their original tenacity, the parts of the carapace were re-united, the skeleton was articulated, and both are now placed in the museum.”

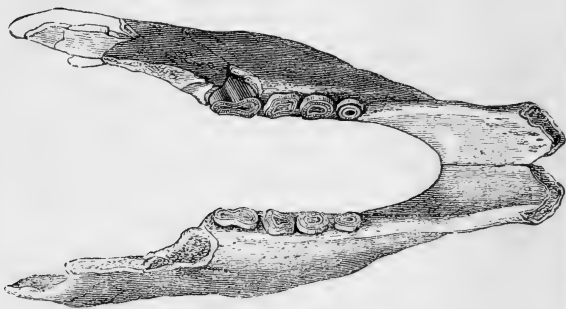
We may here observe that the tessellated carapace belongs to a large extinct armadillo, to which the largest

living species, the *Dasypus gigas*, is but a pigmy ; it is termed by Professor Owen *Glyptodon clavipes*.

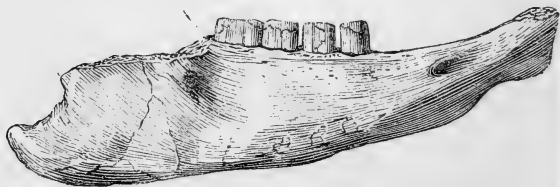
With respect to the fossil genus *Myiodon*, Professor Owen describes three distinct species, viz. *M. Darwinii*, *M. Harlani*, and *M. robustus*, which far exceeds the others in size.

We regret that want of space prevents us from following Professor Owen through his elaborate examination of the skeleton of *Myiodon robustus*, which to the scientific is replete with interest, nor enter into the affinities of the myiodon to the megatherium, megalonyx, and other extinct Edentata, which are rigidly scrutinized.

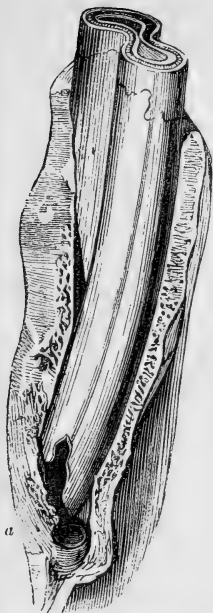
Fig. 106 represents the lower jaw of myiodon : Fig.



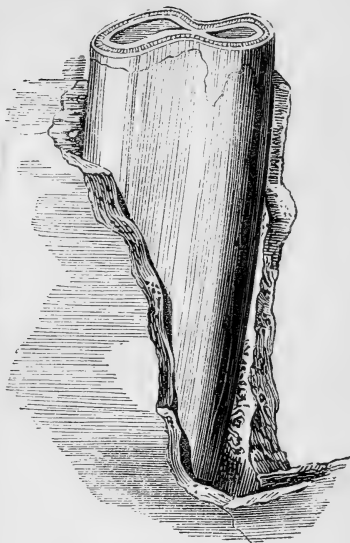
106.—Lower Jaw of Myiodon.



107.—Right branch of the above ; external view.



108.—Tooth of Mylodon.



109.—Tooth of Mylodon.

107, the external view of the right branch of the lower jaw of mylodon. Figs. 108 and 109, the simple teeth of mylodon, showing the depth of their implantation. The cavity at the base of the tooth is seen at *a*, Fig. 108. As in the sloth, the megatherium, and megalonyx, these teeth, formed for crushing leaves, are composed of a central pillar of coarse ivory, immediately invested with a thin layer of fine dense ivory, and the whole surrounded with a thick coating of cement.

From the structure of these teeth it is evident that the

mylodon fed on leaves, like the sloths of the present day. But, notwithstanding Dr. Lund's opinion, it was certainly not adapted for climbing trees; besides, what trees could bear its weight? How then did it obtain its food? The whole of its osseous conformation suggests the answer—it was formed to uprend the trees that bore its sustenance. The enormous expanse of the pelvis, the great bulk and strength of the hind-legs, the solidity of the tail, to which its evidently vast muscles were attached, enabling it with the hind-limbs to complete a firm tripod of support, the proportions of the fore-limbs, unequalled for massiveness by those of any existing or extinct animal, the size and strength of its claws,—in short the whole mechanism of the colossal frame becomes intelligible only on the ground of the herculean labour to which the animal was appointed. Perhaps it commenced the process of prostrating the chosen tree by scratching away the soil from the roots, and then proceeded to grapple with it thus partially undermined, and apply the surpassing strength of its limbs and body, the muscles of the trunk and extremities being animated by the influence of the unusually large spinal chord.

It may here be stated that the skull of the specimen described by Professor Owen had at some time or other been fractured and had healed; the animal living long afterwards: and it will at once occur to the reader that these animals must have been unusually liable, from their habits, to blows from heavy falling bodies; to meet such accidents the skull was peculiarly constructed, its outer and inner table being separated by extensive air-cells, so that the fracture of the outer table might occur without injury to the brain. It was by virtue of this structure that the subject of the Professor's memoir appears to have been saved.

SCELIDOTHERIUM.

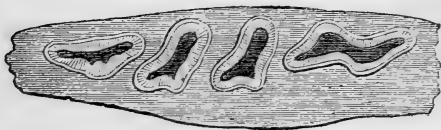
Our Figures represent—Fig. 110, the remains of the skull; Figs. 111, 112, the dentition of an extinct animal, to which Professor Owen has given the title of *Scelidotherium*. Figs. 113, 114, show the depth of the im-



110.—Remains of Skull of Scelidotherium.



111.

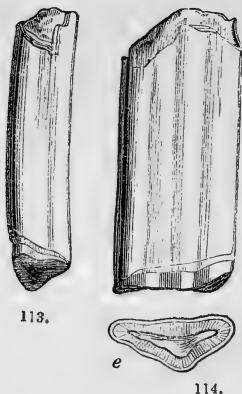


112.

plantation of the teeth and their structure : *e*, the crown of a tooth seen from above.

This animal was evidently allied to the mylodon and megatherium, and belongs to the same family.

The fossil remains, viz. a cranium, several vertebræ, the scapulæ, and various bones of the limbs, were discovered by Mr. Darwin at Punta Alta, in northern Patagonia, and in the same bed of partly consolidated gravel as that wherein the lower jaws of toxodon and a species of mylodon were imbedded. All the parts were



113.

114.

discovered in their natural relative position, indicating, as Mr. Darwin observes, that the sublittoral formation in which they had been originally deposited had been but little disturbed. This beach is covered at spring-tides, and many portions of the skeleton were encrusted with *fustræ*. Small marine shells were lodged within the crevices of the bones.

The teeth in structure resemble those of the mylodon; there are neither incisors nor canines; the molars are five on each side above, and four below. According to Professor Owen, of all the Edentata the Cape Ant-eater, or Aard-vark, most nearly resembles the scelidotherium in the form of the skull; and next to the aard-vark may be cited the great armadillo (*Dasypus gigas*).

“Although the Scelidotherium, like most other Edentals, was of low stature, and, like the megatherium, presented a disproportionate development of the hinder parts, it is probable that, bulk for bulk, it equalled, when alive, the largest existing pachyderms not proboscidean. There is no evidence that it possessed a tessellated osseous coat of mail.”

THE MEGATHERIUM.

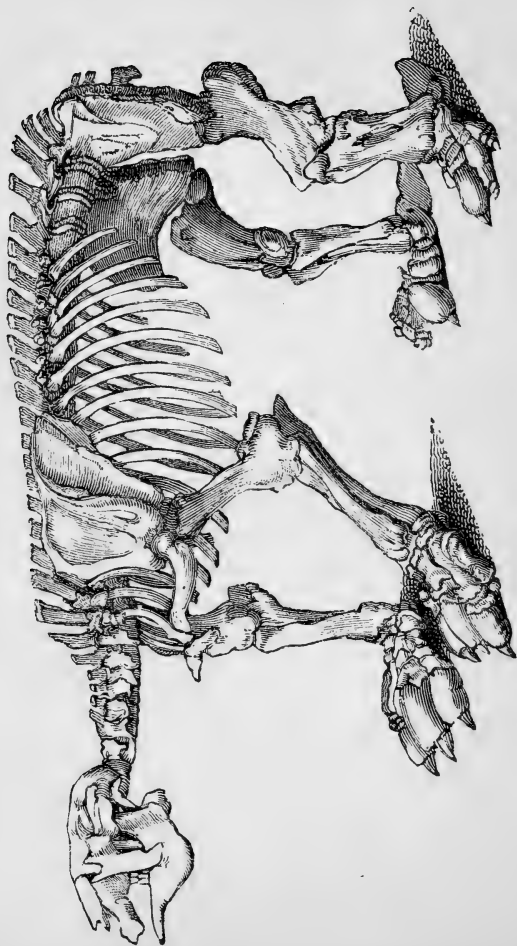
The relics of this colossal beast, of which Fig. 116 represents the skeleton, have been discovered only in South America, of which continent, at some remote period, it was an inhabitant.

The affinity of this animal to the sloths and other Edentata was pointed out by Cuvier, but many points required elucidation; in fact zoologists have been led, not without apparent grounds, into some errors, recently corrected.

For a long time the museum of Madrid afforded the only relics of the megatherium in Europe; but the skeleton they compose is deficient in several of its parts: fortunately the recent acquisition by the Royal College of Surgeons of a great portion of the bones of this animal has tended to supply the defects, at least to a considerable extent.

These splendid and valuable remains form the subject of an interesting paper from the pen of Mr. Clift, in the third vol., p. 3, of the 'Trans. Geol. Soc. Lond.,' accompanied by an improved figure of the skeleton, and figures of various detached parts, together with a map of that part of the province of Buenos Ayres in which the places where the bones in question were found, and also those of the Madrid specimen, are marked down.

The acquisition of these remains by the Royal College of Surgeons is due to the zeal and liberality of Woodbine Parish, Esq. "They were found in the river Salado, which runs through the flat alluvial plains to the south of the city of Buenos Ayres. Their discovery was owing to a succession of unusually dry seasons in the three preceding years, which lowered the waters in an extraordinary degree, and exposed part of the pelvis to view as it stood upright in the bottom of the river. It appears that this and some other parts of the skeleton, having been carried to Buenos Ayres by the country-people, were very liberally placed at Mr. Parish's disposal by Don Hilario Sosa, the owner of the property on which they were found. In the hope of obtaining the other



116.—Skeleton of Megatherium.

parts of the skeleton, an intelligent person was subsequently sent to the same spot, who succeeded, after considerable difficulties, in getting out of the mud forming the bed of the river the remainder of the collection. Further inquiry led Mr. Parish to suppose that similar remains might be met with in other parts of the provinces of Buenos Ayres, and he applied to the local authorities to assist him in making further search. This was given by the governor, Don Manuel Rosas, and the remains of the other two skeletons were found on his Excellency's own properties of Las Averias and Villanueva, one to the north, the other to the south of the Salado, but at no great distance from the place where the first had been discovered. In the latter instance the osseous remains were accompanied by an immense shell, or case, portions of which were brought to this country." A fragment of this shell, or osseous shield, is figured by Mr. Clift; its external surface is rough, and it appears to consist of an assemblage of smaller parts, like rosettes in sculpture. united together by sutures; the sutures being plainly marked on the under surface, which is smooth. By M. Blainville, Dr. Buckland, and indeed by most naturalists, this buckler or carapace was regarded as belonging to the megatherium, whose colossal bulk it was regarded as having protected, as is the case in the armadillos, to which it was believed to be closely related, not only in structure and habits, but also food.

It has, however, been recently demonstrated by Professor Owen, and we believe to the entire satisfaction of Dr. Buckland himself, that the tessellated carapace found with the Salado remains did not belong to the megatherium, but to a large armadillo-like animal, to which Professor Owen assigned the title of *Glyptodon*, and whose hind-feet, like the fore foot, appear to be so modified as to form the bases of columnar limbs destined to support an enormous incumbent weight. Moreover, from a rigorous examination of the details of the skeleton of the megatherium, into which we forbear to enter, he proves the incompatibility of such a shield with its osseous structure, which differs in marked essentials from that of

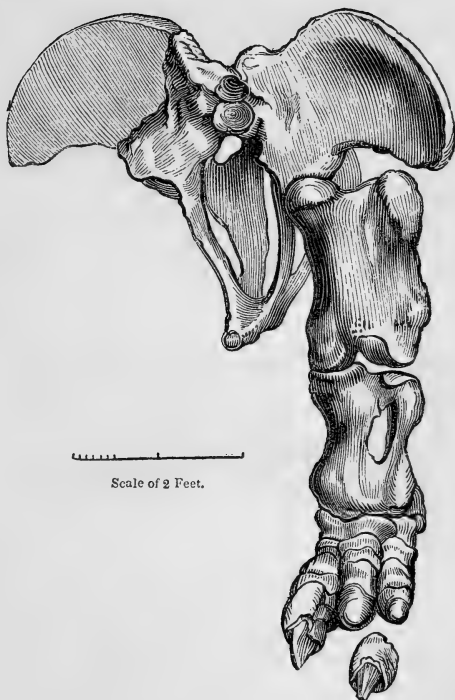
the armadillo, in which latter animal the skeleton is expressly modified for the armour which covers the back and head.

In his paper on the Glyptodon, wherein the claims of the megatherium to this armour are discussed, Professor Owen gives a tabular account of the discovery of twelve skeletons of [the megatherium, and in no instance did any portion of bony armour occur with or near the bone; and in a note the writer of the article 'Megatherium' in the 'Penny Cyclopædia' states as follows :—

"Sir Woodbine Parish has just now (May 29, 1839) kindly communicated to us a letter received by him, giving information of the discovery of an almost entire skeleton of an adult megatherium on the banks of the Rio de la Matanza, with all the vertebræ of the body, all the ribs, all the teeth, the head and the legs, in short, with the whole of the bones except the tail and one foot. Close to it was the skeleton of a 'tatou gigantesque' (glyptodon probably), with its bony armour complete. There was also found a very small and perfect megatherium, which must have been only just born at the epoch of destruction. No mention is made of any traces of bony armour or shell about the megatheria. In the old animal only one foot is wanting. It has been suggested that the so-called young megatherium may possibly be a skeleton of scelidotherium."

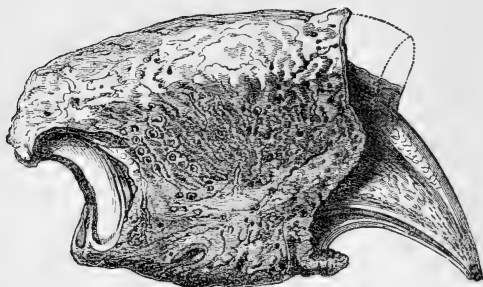
It is then to the armadillo-like glyptodon, and not to the megatherium, that the strong bony armour belongs; of this latter animal relics have been found on the left bank of the Pedernal, near Monte Video, and are preserved in the Museum of that town. Portions of bony armour also have been obtained in the Rio Seco and Banda Oriental, similar in structure to the specimen of the Pedernal.

"The collection of fossils," says Professor Owen, "brought to England from South America by Mr. Darwin, has enabled me to add the following facts to the history of the megatherium. Its teeth, for example, do not differ in number from those of the sloths, there being five on each side of the upper jaw. Microscopic

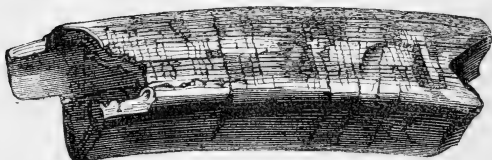


117.—Pelvis and Hind Leg of Megatherium.

examination having demonstrated a marked difference in the intimate structure of the teeth of the sloths and armadillos, I have ascertained by this mode of investigation that the teeth of the megatherium have the same texture and composition as those of the sloth. And if from identity of dental structure in two different



118.—Ungueal Phalanx of Megatherium.



119.—Tooth of Megatherium.

animals we may predicate a similarity in their food, a glance at the bony framework of the megatherium is sufficient to show that it must have resorted to other means of obtaining its leafy provender than that of climbing for it, whereby the necessity of inferring a proportionate magnitude of the trees which nourished the megatherium is obviated." It would appear that, like the mylodon, the megatherium uprooted the trees, on the leaves of which it fed, and was furnished with a small proboscis as an adjunct to the tongue in stripping off the smaller branches of the prostrate tree; its skull, moreover, has the two tables separated by cells, as in the mylodon. Fig. 117 represents the pelvis and hind-leg of the megatherium in the Royal College of Surgeons;

Fig. 118 the ungual phalanx; Fig. 119 the teeth of megatherium.

With respect to the megalonyx, it was an animal closely related to the megatherium, and doubtless of the same habits, but of inferior size, not exceeding the size of an ox, though more solidly and heavily built. Its relics are apparently more rare than those of the megatherium, at least fewer have been recovered.

SECTION II. INSECTIVOROUS EDENTATA.

FAMILY—LORICATA (OR ARMADILLOS).

THIS family group includes the true armadillos (*Dasypus*), the chlamyphorus, and also the aard-vark, or African ant-eater, which, though not covered with armour, approaches in its structure nearer to the armadillos than to the American ant-eaters (*Myrmecophaga*), with which animals it was formerly associated, and which it resembles very closely in manners and food.

The armadillos (*Dasypus*) are divided by Cuvier into five minor groups, or subgenera, according to the number of the teeth and fore-claws; viz. *Cachichames*, *Apars*, *Encouberts*, *Cabassous*, and *Priodontes*.

The *Cachichames* have four toes on each foot, and seven teeth on each side above and below. The *Apars* have four toes on each foot, and nine or ten teeth in each side in both jaws. The *Encouberts* have five toes on the fore-feet, and nine or ten teeth on each side above and below, with two incisor teeth in the upper. The *Cabassous* have five toes, but those of the fore-feet are disposed obliquely, and in such a manner that the thumb and index finger are small, the middle and fourth toes armed with tremendously large trenchant claws, and the fifth very small: teeth nine or ten on each side above and below. The *Priodontes*, in addition to the unequal toes and enormous claws of the *Cabassous*, have from twenty-two to twenty-four small teeth on each side in each jaw.

The armadillos are exclusively confined to the warmer portions of the American continent, and the species are tolerably numerous, none, however, attaining to a very

large size excepting the *Dasypus gigas*, which itself is but a pigmy to the extinct glyptodon.

These animals are burrowing in their habits, with thick, short, powerful limbs, and a flattened, broad, stout body, covered above with plates and bands of horny armour. The head is broad between the eyes, whence it runs to a pointed muzzle; the mouth is small: the teeth are cylindrical, feeble, destitute of true roots, set apart from each other, and mutually fit, when the jaws are closed, into the intervals. The tongue is smooth, slender, and moderately extensible: it is most probably endowed with the sense of taste in a high degree, as we have observed, especially in one species, the *Dasypus peba*, the animal touched with it whatever was presented by way of food; and we know that it is lubricated abundantly with a glutinous fluid, poured out chiefly from the submaxillary gland. (See 'Zool. Proceeds.' for 1831, p. 144.)

The portions of armour which cover these animals consist of a triangular or oval plate on the top of the head, or rather on the chaffron, its posterior margin projecting over the neck; a large buckler over the shoulders, and a similar buckler over the haunches; while between these solid portions there intervenes a series of transverse bands overlapping each other's edges, and allowing to the body due freedom of motion. Each of these separate portions consists of a multitude of small parts, all consolidated together, giving the idea of what is termed mosaic-work, especially on the head and shoulders, the pattern differing in different species. The limbs, which are short and thick, are almost entirely concealed by the edges of this armour, but the feet, which are unprotected by it, are covered by a hard tuberculated skin. The tail is covered with a series of calcareous rings; the skin of the under surface of the body is very rough and beset with long scattered hairs; and from between the joints of the rings and plates of the dorsal armour there issue hairs of the same kind, more numerous in young than adult individuals. In some species, however, as the matabo (*Dasypus apar*), whose armour is peculiarly thick and solid, no hair is to be discovered.

The eyes of the armadillos are small and lateral ; the ears, varying in size in the different species, are firm, and covered with tuberculated skin. Most of the species are nocturnal in their habits, remaining concealed in their burrows during the day ; these are of considerable extent, dipping at an inclination of about 45 degrees ; they have one or two sharp turns, and are very narrow, just admitting the passage of their occupier. The animals make these burrows with great expedition, and can only be forced out by smoke or water ; such is their strength and the tenacity of their hold, that they have been known to leave their tail in the hands of the hunter, on his attempt to drag them forth.

When alarmed during their excursions, the first endeavour of these animals is to gain their burrows, to which they run with a degree of celerity little to be expected from their clumsy appearance. Most of the species will easily outstrip a man ; their movements, however, resemble those produced by mechanism, for, as the spinous processes of the vertebral column are all inclined the same way, viz. towards the tail, there being no central points to which those of the upper and those of the lower portion mutually converge, so the motions of the limbs are unaccompanied by corresponding inflexions of this column, as is the case in other animals whose progressive motions are free and unconstrained.

When hard pressed and unable to gain their burrow, they either attempt to dig a temporary place of refuge, or they gather up their limbs beneath their coat of mail, bend down their head, assume a partially rolled-up figure, and wait the event. The mataco, which does not burrow, and is by no means swift, can roll itself up completely. They never attempt to bite or otherwise defend themselves. The food of the armadillos consists principally of fallen fruits, roots, and worms ; but they do not reject carrion, and have been known to penetrate into graves, when not properly protected by stones or brick-work. Azara informs us that ants are never found in the districts inhabited by the armadillos, and that these animals break into the ant-hills, and devour the insects as greedily as

the true ant-eaters. Nature, it is true, has not provided them with the same apparatus for this purpose, but the armadillos may, notwithstanding, destroy vast quantities of ants, though it is probable that they expel them from their own peculiar districts as much at least by destroying the habitations as by actually devouring the insects themselves. The ordinary food of the armadillos consists chiefly of the roots of the manioc, of potatoes, maize, and other similar substances of a vegetable nature, though, as already observed, without rejecting animal substances naturally soft or so far decomposed as to be easily torn without the help of canine teeth. They are also very destructive to the eggs and young of such birds as build their nests on the ground, and greedily devour worms, frogs, small lizards, and, M. Azara says, even vipers. The chief animal food of the armadillos, however, is derived from the immense herds of wild cattle which cover the plains and savannas of every part of South America. These are rarely slaughtered but for the sake of the hide and tallow; and as the carcasses are left to rot on the pampas, or plains, the smell soon attracts vast crowds of carnivorous animals of various species, and, among others, great numbers of armadillos, which greedily devour the half-putrid flesh, and soon become extremely fat and corpulent. In this condition, notwithstanding the filthy nature of their food, their flesh is esteemed a great delicacy, both by the native Indians and by the Portuguese and Spaniards of America. The animal is roasted in its shell, and considered one of the greatest dainties which the country produces.

The armadillos see but indifferently, particularly in bright sunshiny weather; but their sense of hearing is extremely acute, and amply compensates for any imperfection of sight. When alarmed by any unusual or strange sound, they prick up their ears, stop for a moment to satisfy themselves of its distance and direction, then commence a precipitate retreat to their burrow, or, if that be too remote, begin to construct a new one. Smell is, however, by far the most acute of their senses.

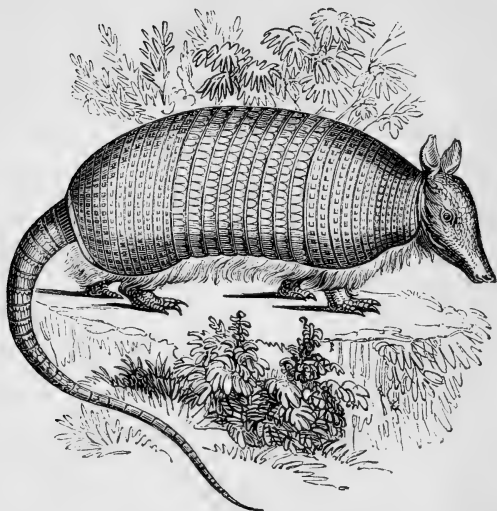
It is generally believed that the female armadillo

brings forth but once during the year, but she produces at a birth frequently six, eight, or even ten young ones : yet she has never more than four teats, and, according to the report of M. Azara, the most accurate and extensive observer who has written upon the history of these animals, in some species only two—an anomaly, with respect to the number of young and the number of teats, which appears to contradict the general rule observable among other mammals.

It may here be observed that one of the weasel-headed armadillos (*D. encoubert*) in the Zoological Gardens produced only two at a birth : when first born they were quite blind, about four inches in length, soft, and white, but the skin presented all the furrows and mosaic-work which characterize it when indurated and solid. The growth of these animals was not a little surprising ; in six or eight weeks they attained nearly to the size of their parents. One born on the 3rd of September, 1831, and which died on the 16th of November of the same year, had increased in weight during that short period 52 ounces 2 drams, and measured $11\frac{1}{2}$ inches from the nose to the root of the tail. The young are far more hairy than the adults.

THE PEBA (*Dasypus peba*).

The Tatouhou, or Black Tatu, of the Guaranis, is an example of Cuvier's group of Cachichames, which, according to Gumilla, is the general name of the armadillos on the banks of the Orinoco. In zoological catalogues we find it under the ambiguous names of *Dasypus septemcinctus*, *D. octocinctus*, and *D. novemcinctus* ; three different species being thus made out from the erroneous supposition that the number of moveable bands on the back was invariable in the same species : whereas the truth is that the number of bands is subject to a certain degree of variation ; thus in the mule armadillo there are six or seven bands, in the peba from six to nine. It appears also that the young have not the full complement of bands, by one or two, which become developed afterwards. The peba (Fig. 120) is a native of Guiana,



120.—Peba.

Brazil, and Paraguay, and is timid and nocturnal; it is tolerably rapid in its movements, and very expert in burrowing.

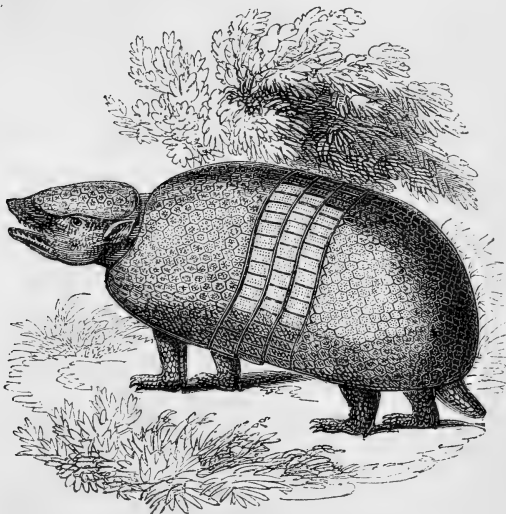
It is never found in woods, but frequents the open and cultivated plains, and is much hunted by the inhabitants on account of its flesh, which, when roasted in the shell, is said to be extremely delicate, resembling that of a sucking-pig.

The length of the head and body is about sixteen inches; of the tail, which is slender and tapering, fourteen inches. The muzzle is greatly elongated, straight and pointed; the ears are rather large and the eyes small; the tongue long, narrow, pointed, and extensible. The general colour of the shell is dusky black.

Allied to the peba is the mule armadillo (*Dasypus hybridus*, Desm.), called M. Courigua, or Mule Tatu, by the Guaranis, in allusion to its long upright ears. It is of smaller size than the peba, and its tail is comparatively shorter. It wanders by day over the plains, feeding on beetles, larvæ, roots, &c.; differing from the peba in being diurnal in its habits. It is common on the pampas of Buenos Ayres.

THE MATACO (*Dasypus apar*).

This species is an example of Cuvier's group of apars. The Mataco, or Bolita (little ball) as it is sometimes called, has its shell of defence extremely hard and solid, forming an admirable coat of mail. It has only three



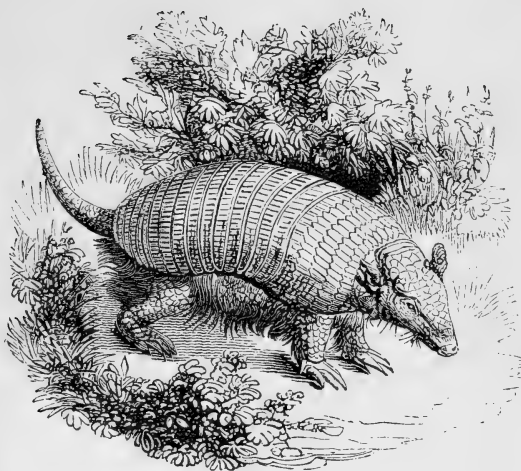
121.—Mataco.

bands on the back. Of all [the armadillos, the mataco is the only one which can assume the complete figure of a ball, enclosing the head and legs; and this faculty, together with the strength of the skull, appears the more necessary, as it does not burrow, its limbs being feeble, and its claws little adapted for scratching up the ground. It is diurnal in its habits, and slow in its movements. It is a native of the pampas of Buenos Ayres; the tail is short, not much exceeding two inches in length, while the head and body measure nearly fifteen inches. (Fig. 121.) Rolled up in its tessellated shell, it is safe from the attacks of dogs; "For the dog," says Mr. Darwin, "not being able to take the whole in its mouth, tries to bite one side, and the ball slips away. The smooth hard covering of the mataco offers a better defence than the sharp pines of the hedgehog." A shell of this species, which formed the cup of a cacique, is in the Mus. Zool. Soc.

THE POYOU, OR WEASEL-HEADED ARMADILLO

(*Dasypus encoubert*, Desm.).

This Armadillo belongs to Cuvier's section termed *Encouberts*: it is very common in Paraguay, and burrows in the ground with almost incredible celerity. Its strength and activity are very remarkable, and, notwithstanding the shortness of its legs, few men can overtake it. It is of a restless unquiet disposition, inquisitive, and confident; and when any noise is made at the entrance of its burrow, it is said to come fearlessly forth to investigate the cause. Its voice is a low grunt, like that of a young pig. These animals live solitary or in pairs, and haunt wooded districts, where they excavate very deep burrows; when danger threatens, they carry on their mining operations, rendering it difficult to dig them out. They feed upon melons, potatoes, and other vegetables; but also to a great extent upon carrion; the natives nevertheless eat the flesh of this species without any repugnance. When it stops or rests on the ground, it has a habit of squatting like a hare in her form, and



122.—Weasel-headed Armadillo.

In this situation the great breadth of the body is very apparent. The head is large, flat, and nearly triangular; the face short, and the muzzle blunt; the ears are moderate.

Several individuals of this armadillo have at various times lived in the menagerie of the Zoological Society. They appear to have little fear, and soon become familiar even with strangers: when running about their enclosure, during warm or sunny weather, they turn up the turf rapidly with their noses, apparently in search of worms or insects; bread and milk is the diet on which they are fed: their actions are prompt and rapid. The poyou measures about sixteen inches in the length of the head and body; the tail is about six or seven inches long. (Fig. 122.)

Another example of this section is the Pichiy, or

Pichy (*Dasypus minutus*). It is extremely abundant on the arid plains near the Sierra Ventana, and likewise in the neighbourhood of the Rio Negro. "At Bahia Blanca," says Mr. Darwin, "I found, in the stomach of this armadillo, coleoptera, larvæ, roots of plants, and even a small snake of the genus *Amphisbœna*,"

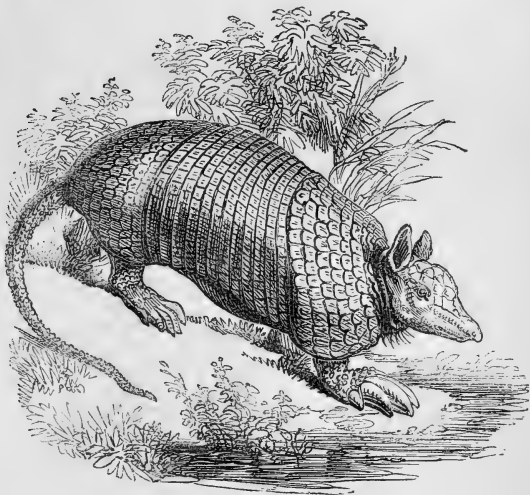
"The pichy prefers a dry soil; and the sand-dunes near the coast, where for many months it can never taste water, are its favourite resort. In the course of a day's ride near Bahia Blanca several were generally met with. The instant one was observed, it was necessary, in order to catch it, almost to tumble off one's horse: for if the soil was soft, the animal burrowed so quickly, that its hinder quarters almost disappeared before one could alight. The pichy likewise often tries to escape notice by squatting close to the ground. It appears almost a pity to kill such nice little animals; for, as a Gaucho said while sharpening his knife on the back of one, 'Son tan mansos' (They are so quiet)."

The pichy measures only ten inches in the length of the head and body, and about four inches in that of the tail. It is diurnal in its habits.

THE TATOUAY (*Dasypus tatouay*, Desm.).

This species is an example for Cuvier's section *Cabassous*. The Tatouay, or wounded Armadillo, is so called by the Indians in allusion to its tail, which is naked, or as it were rudely deprived of the crust or bony tube which covers this organ in all the other species. The whole length of the tatouay, as given by Azara, is twenty-six inches and a half, including the tail, which is seven inches and a half, round, pointed, and naked, with the exception of a few round scales or crusts on the under surface of the third nearest to the extremity, which frequently trails along the ground when the animal walks: the rest is covered with soft brown fur, interspersed with a few stiff short hairs on the superior surface. The head is longer, narrower, and more attenuated than that of the poyou, though considerably less so than in the peba and mule armadillo; the ears are unusually large, being

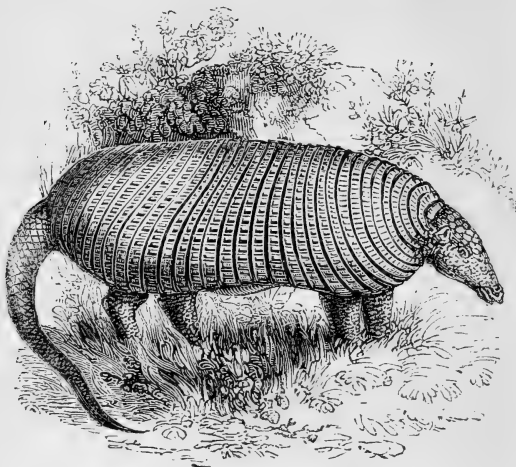
nearly two inches long, and in figure forming a segment of a circle; the body is round; the claws of the fore-feet, particularly that of the middle toe, are excessively large. The bucklers of the croup and shoulders are composed of ten and seven rows of scales respectively, each scale forming an oblong rectangle; the moveable bands are thirteen in number, composed of scales much smaller than those of the bucklers, and of a nearly square figure. (Fig. 123.) The habits of this species are altogether unknown. It inhabits Guiana and Brazil, and is rarely found so far south as Paraguay.



123.—Tatouay.

THE GREAT ARMADILLO (*Dasypus gigas*).

This armadillo is an example of Cuvier's group *Priodontes*. The Great Armadillo measures nearly three feet three inches in length, from the nose to the origin



124.—The Great Armadillo.

of the tail ; the head is seven inches and a half long, the ears an inch and three-quarters, and the tail one foot five inches. Its superior size is alone sufficient to distinguish this species from all the other known armadillos, but it possesses numerous other characters not less remarkable. Its head is proportionately smaller than in the other species, the forehead is more protuberant, and the face, from the eyes downwards, assumes a tubular cylindrical form, like that of the peba ; the ears are of a moderate size, pointed, and habitually crouched backwards ; the bucklers of the shoulders and croup are composed of nine and eighteen rows of plates respectively, and separated by moveable bands to the number of twelve or thirteen, formed of rectangular scales, about half an inch square. The tail is thick at the root, being upwards of ten inches in circumference : it is gradually attenuated towards the tip, covered with plates disposed in rings at

the base, and forming spiral or crescent-shaped lines throughout the rest of its length. The claws are large and powerful, but in their relative form and dimensions differ little from those of the tatouay already described. (Fig. 124.)

This species inhabits Brazil and the northern parts of Paraguay. It is never found in the open country, but keeps close to the great forests, and burrows with surprising facility. Those who are employed in collecting the Jesuits' bark frequently meet with it in the woods, and report that, when any of their companions happen to die at a distance from the settlements, they are obliged to surround the body with a double row of stout planks, to prevent it from being scratched up and devoured by the great armadillo.

Genus *Chlamyphorus*:

THE PICHICIAGO (*Chlamyphorus truncatus*).

This extraordinary little creature, though scarcely six inches in length, is formed on the plan of the utmost strength and solidity, being destined for burrowing habits. It is a native of Chili, where, like a mole, it works out galleries in the rich soil of the valleys, living for the most part underground in quiet seclusion. So rare is this animal, that it is regarded by the natives as a curiosity. Its food, so far as we are assured by its dentition and the imperfect accounts collected, consists of insects and larvæ: night probably is the season of its activity, and of its unfrequent visits to the "upper world."

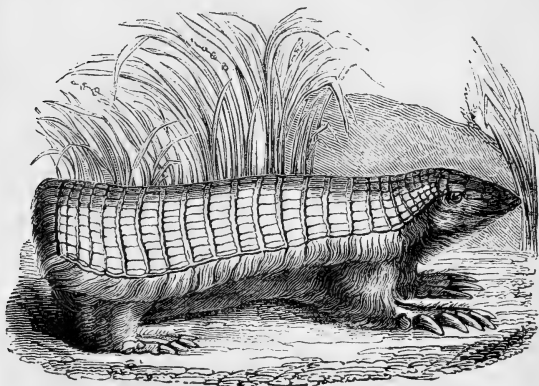
The appearance of the pichiciago reminds us of the armadillos, for it is covered above by a shell, not however of very hard consistence, nor very thick, but of a texture between horn and leather. This shield-like plate commences on the head and extends over the back and haunches, over which latter it dips down quite abruptly and perpendicularly, so as to make it seem as if the body was cut off abruptly at its hinder part. It is divided by intersecting furrows into a series of bands or strips, each strip being itself made up of fifteen or twenty plates of a square form, except on the head, which is



125.—Extremity and Tail of Pichichiago.

covered with a single plate composed of a mosaic-work of rounded and irregular portions, and the perpendicular haunch-plate, which is also tessellated. This horny covering or shield is not fixed by the whole of its inferior surface to the integuments beneath, as is the case with the armadillo; but merely rests on the back, free throughout, “excepting along the spine of the back and top of the head; being attached to the back, immediately above the spine, by a loose cuticular production, and by two remarkable bony processes on the top of the os frontis (bone of forehead), by means of two large plates which are nearly incorporated with the bone beneath; but for this attachment, and the tail being firmly curved beneath the belly, the covering would be very easily de-

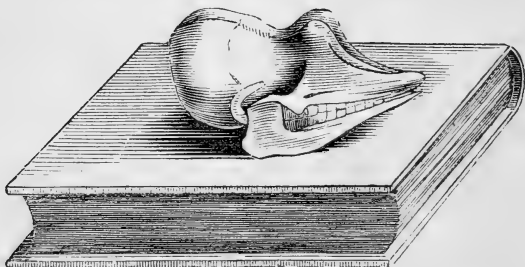
tached." The extremity of the tail is formed like a paddle. (Fig. 125.) "The whole surface of the body and underside of the shield are covered with fine silk-like hair (of a delicate straw colour), longer and finer than that of the mole, but not so thick. The anterior of the chest is large, full, and strong; the anterior extremities short, clumsy, and powerful." The hand, which is amazingly thick and compact, is furnished with five powerful but compressed nails, which, arranged together in their natural situation, constitute one of the most efficient scrapers or shovels which can be possibly imagined; and expressly adapted for progression underground, but in an equal ratio ill fitted for celerity on the surface. The hind-legs are comparatively weak, the feet being long and plantigrade, the toes being furnished with small flattened nails. (Fig. 126.) Sight is but a secondary sense as regards its importance in the economy of an animal living in darkness beneath the ground. The organs of vision, therefore, are very minute, and buried in the silky fur by which the circular orifices of the ears are com-



126.—Pichiciago.

pletely concealed. The head is almost conical in figure, going off from a broad base to a pointed muzzle furnished with an enlarged cartilage, somewhat as in the hog, and doubtless for the purpose of grubbing and burrowing for food.

In accordance with the details of external configuration, the skeleton is equally indicative of the animal's habits. The skull is firm, and prevented from being pressed upon by the shield, which rests on the two projections. The bones of the fore-limbs are short, thick, and angular; the scapulæ broad and strong; the ribs



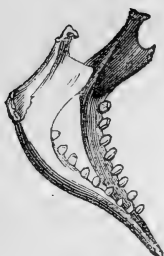
127.—Skull of Pichiciago.



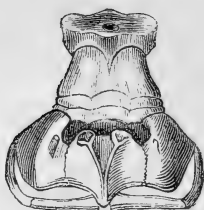
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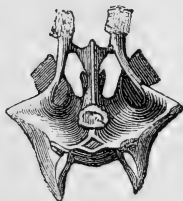
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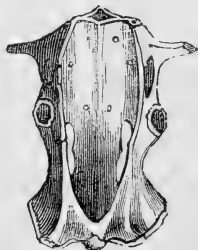
131.

thick, and capable of resisting great pressure. The hip-bones are of singular construction, and admirably formed for protecting the internal organs from injury. Such is an outline of the structure and habits of the chlamyphorus, an animal which, though bearing in some points a resemblance to the armadillos, yet possesses characters so exclusively its own as to render it one of the most interesting discoveries in zoology. Of this rare animal two specimens alone exist, one in the Museum of Philadelphia, the other, with its skeleton, in the Museum of the Zoological Society, London.

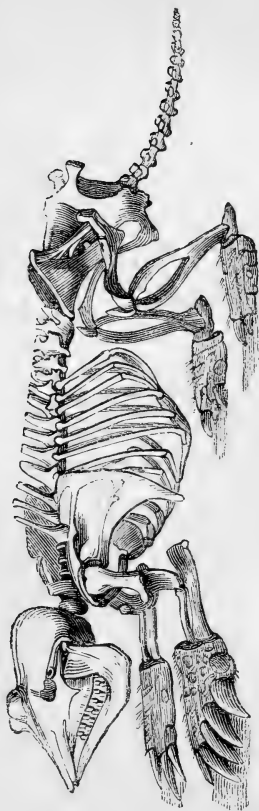
For an account of the structure of this animal, see Mr. Yarrell's paper in the 'Zoological Journal.' Fig. 127



132.



133.



134.—Skeleton of Pichiciago.



135.

represents a lateral view of the skull of the pichiciago ; Fig. 128, an upper view ; Fig. 129, a basal view of the same ; Fig. 130, lower jaw ; Fig. 131, the cervical vertebræ, and first bone of the sternum, with parts of the first and second ribs seen from below. Fig. 132, pelvis seen from behind ; Fig. 133, same seen from below : Fig. 134, the skeleton ; Fig. 135, vertebræ of tail.

Genus *Orycteropus* :—

THE AARD-VARK (*Orycteropus Capensis*).

This animal, known to the colonists of the Cape of Good Hope by the name of aard-vark, or earth-hog, is the sole example, as far as ascertained, of the genus *Orycteropus*. The aard-vark is essentially burrowing in its habits, and insectivorous in its diet. Its proportions are thick and strong, though the general contour is

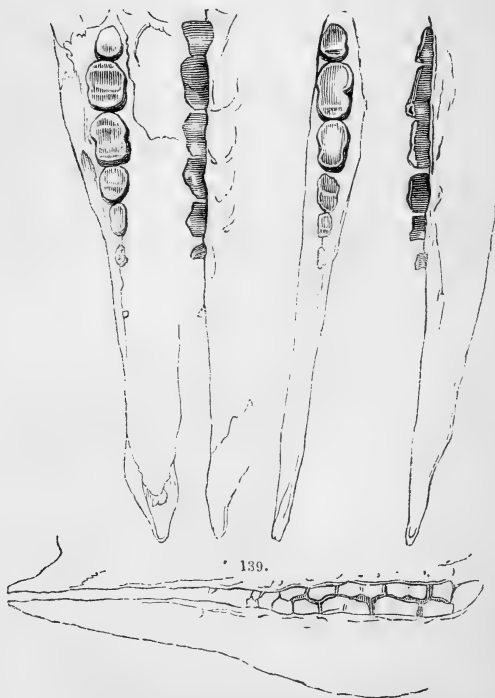


136.—Aard-vark.

elongated and the limbs short. It is neither protected by plates nor scales, but the skin is thick, tough, and coarse, and covered with stiff hair, resembling bristles in quality, and somewhat scantily disposed, especially on the head. The muzzle is elongated, narrow, and hog-

137.

138.



137-139.—Teeth of Aard-vark.

like at its apex; the mouth small, and the tongue extensible; the eyes are rather small; the ears large, long, and pointed; the tail tapering from a very stout base; the limbs are short, thick, and very muscular; the fore-feet have four stout toes armed with large solid nails, resembling hoofs in appearance, and admirably adapted as scrapers of the dry hard ground of an African desert. The hind-feet are long and plantigrade, having five toes armed with nails of the same character as those of the fore-feet. (Fig. 136.)

The teeth consist of seven molars on each side above, of which the first is minute and distinct from the rest, and six on each side below. Fig. 137 gives the teeth of the upper jaw in two views; Fig. 138, those of the lower jaw; Fig. 139, the teeth of both jaws together.

The aard-vark attains to a considerable size, measuring, when fully grown, upwards of five feet in total length, of which the tail is one foot eight or nine inches. Its food consists exclusively of ants, which it takes by means of its long glutinous tongue, after effecting a breach in the dome-like houses of solid indurated mud-work which those insects construct, and which are very abundant in certain districts. These hillocks are from two to three feet high, and their structure is irregularly cellular, not unlike volcanic honeycomb-stone, exhibiting a maze of passages opening into each other. In demolishing these buildings for the sake of their multitudinous inmates, which are devoured by wholesale, the aard-vark employs the active portion of its existence. The dwelling of the aard-vark itself is a burrow at a little distance beneath the surface of the ground, out of which it comes forth only during the night, for in its habits it is entirely nocturnal; hence during the day it is seldom seen, but may be observed as the dusk approaches creeping from its hole intent upon its prey. These burrows, where numerous (as they are in some districts, where also innumerable ant-hills cover the plain), are dangerous to waggons travelling over the country; and cattle and horses occasionally break through the surface of the ground into them, and thus suddenly stumble or fall.

They are often very extensive, and it is incredible with what despatch the animal makes them, and with what rapidity it mines onwards when endeavouring to elude the search of persons attempting to dig it out of its retreat; hence it is not captured without difficulty. The flesh of the aard-vark, and especially the hind-quarters when made into hams, are accounted excellent.

The aard-vark is a connecting link between the armadillos and the next section.

FAMILY—TOOTHLESS ANT-EATERS.

Genus *Myrmecophaga*.

The genus *Myrmecophaga*, as established by Linnæus and retained by Desmarest and others, is not strictly natural. Perhaps we should hardly be justified in separating the Tamandua from the Tamanoir (Great Ant-bear, or Ant-eater); but with respect to the little two-clawed ant-eater it certainly forms the type of a distinct genus.

THE GREAT ANT-EATER, OR ANT-BEAR

(*Myrmecophaga jubata*).

The Tamanoir of Buffon. This species, a native of Guiana, Brazil, and Paraguay, is characterized by the total absence of teeth, a narrow head with an extremely slender elongated snout, contrasting strangely with the clumsy massive contour of the limbs and body. The mouth is a small slit at the extremity of the snout; the eyes are small, and the tongue long, cylindrical, and protractile, constituting an organ for obtaining insect food, and is lubricated by a gummy saliva; the limbs are short, but of great thickness, furnished with huge hook-like claws well adapted for making forcible entrance into the solid dwellings of the termite ants. The claws of the fore-feet are four in number, the inner one being the smallest; of the hind-feet five. Those of the fore-feet, in a state of repose or when the animal is walking, are doubled inwards on a rough callous pad, and the outer portion only of the fore-feet is applied to the ground.

The claws of the hind-feet are short, and the sole is a naked protuberant pad. The ears are short and round ; the tail is of great thickness at the base, whence it narrows to the apex, being laterally compressed, but its form is hid beneath a profusion of long, coarse, flowing hair, which hangs like a full plume or fringe. The hair of the head is short and close, but over all the rest of the animal it is long and shaggy, particularly on the top of the neck and along the back, where it forms a kind of long mane, and on the tail, where it is a foot in length, and hangs down on each side, sweeping the ground when the ant-bear walks. (Fig.140.)

The prevailing colour on the head, face, and cheeks



140.—Great Ant-eater.

of the ant-bear is a mixture of gray and brown ; that on the upper parts of the body and tail is deep brown, mixed with silvery white. A broad black band, bordered on each side with a similar one of a white or light grayish brown colour, commences on the chest, and passes obliquely over each shoulder, diminishing gradually as it approaches the loins, where it ends in a point. The sides, arms, and thighs are silvery gray, with a slight mixture of brown, marked with two deep black spots, one on the carpus, and the other on the toes ; the hind legs are almost perfectly black, and the breast and belly of a deep brown, almost equally obscure.

The following is an abstract of the habits of this animal, as observed by Dr. Schomburgk (see 'Zool. Proceedings,' 1839, p. 21):—

Dr. Schomburgk observes, that at a distance the ant-bear appears to be a much taller animal than it really is, owing to the elongated and nearly erect hair of the mane, and also the erect manner in which it carries its large bushy tail. When walking, the outer portion of the fore-foot is applied to the ground, and the long claws are then doubled inwards. It runs with a peculiar trot, and is not, as has been represented, slow in its movements and easily overtaken ; for when chased, it will keep a horse in canter, and does not tire readily. White ants, or termites, constitute its chief food. When the ant-bear meets with one of the tumuli constructed by the white ants, it immediately pulls the fabric down by means of its large strong claws, and when the ants are thus exposed, its long slender tongue is thrust out to collect them. The movements of the tongue, alternately being protruded and retracted, are so rapid, says Dr. Schomburgk, that it is no longer surprising how so large an animal can satiate its appetite with such minute insects. The ant-bear is, however, an economist, and does not destroy more than he wants. When he finds that the termites diminish on the surface, and every one seeks to escape in the numerous galleries of the ruined edifice, he uses his left foot to hold some large lumps of the nest, whilst with the right he leisurely pulls them to pieces.

With the termites he swallows a considerable quantity of the material of which the ants' nest is constructed. Of this fact Dr. Schomburgk assured himself by dissection, and he is of opinion that the substance of the nest serves as a corrector.

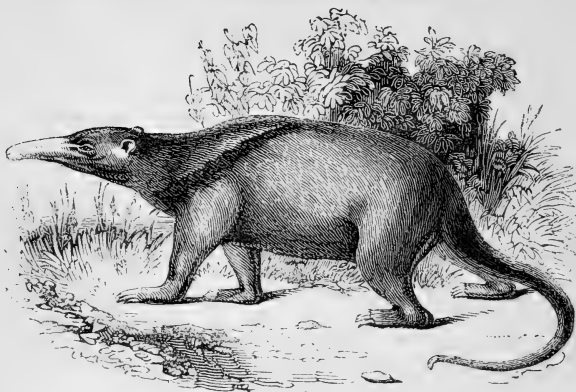
"It has been generally thought," says Dr. Schomburgk, "that the ant-bear lives exclusively on ants; this, however, is not the case. In one which I dissected a year ago a species of *julus* was found; and the avidity with which an adult one now in my possession swallowed fresh meat, which was hashed up for it, makes me believe that even in the wild state it does not satisfy itself exclusively with ants, and, provided the food is of such a size that it can take it up with its moveable upper lip, it does not despise it." According to the same authority the great ant-eater makes no burrow, its tail serving as a sufficient protection: the female produces a single offspring, which she carries on her back; she defends herself by striking with her fore-feet, while raised on her haunches, or throws herself on her back, dealing blows with both her claws. The young soon become tame and familiar, growl like a puppy, or utter a plaintive whine. The sense of smell is exquisite; and the animal is directed more by this than by sight. The teats of the female are two and pectoral. The young remains with its parent for the space of a year.

Dr. Schomburgk domesticated an adult female ant-eater, which he found capable of climbing with great facility and also of taking up objects with its paws. It ate beer, and even fish cut small. When not asleep, it rested on its haunches; but in feeding kneeled as goats and sheep often do. Its height was three feet; the length of the head one foot three inches; of the back three feet seven inches; of the tail three feet six inches.

THE TAMANDUA

(*Myrmecophaga tamandua*, Cuv.; the Middle Ant-eater, Shaw; the Cagouaré of Azara).

This species is a native of Brazil and Paraguay. In the general plan of its osteology the tamandua agrees



141.—Tamandua.

with the tamanoir, but the bones of the muzzle are shorter than the cranial portion, instead of being twice as long: hence the whole head is more abbreviated: the snout is also more conical, and presents a less tubular appearance. Independently, however, of this difference, the tamandua is easily distinguished from its congener. It is far inferior in size, and its tail, instead of being furnished with full flowing hair, is a long, taper, thinly covered organ of prehension, nearly naked indeed at the tip, though well covered at the base. The fur of the body is thick, dense, and harsh, and on the hinder quarters of tolerable length, but on the head and fore-quarters it is short, wiry, upright, and glossy, and radiates from an areola between the shoulders; the point of the muzzle is bare; the eyes are small; the ears of a moderate size and rounded; the mouth is small, and the nostrils are lateral slits. (Fig. 141.)

In the structure of the limbs it closely resembles its larger congener. The tamandua when fully grown measures about two feet in the length of the head and body, and sixteen or seventeen inches in that of the tail.

A young specimen before us measures nineteen inches in the body, and thirteen in the tail; its colour on the head and fore-quarters is yellowish white; the sides of the body, the haunches, and the under surface, together with the base of the tail, being black, and a black stripe passes along each shoulder.

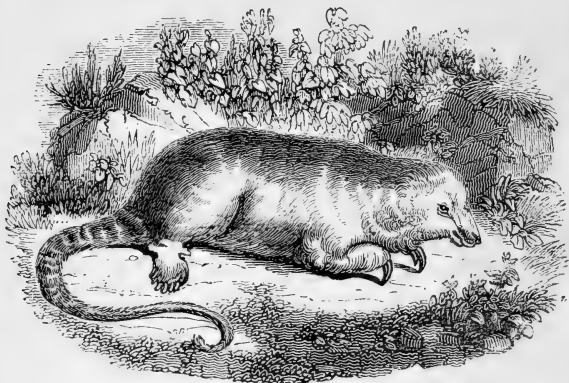
M. Geoffroy regards as distinct species one altogether black, which he terms *T. nigra*, and another with a double shoulder-stripe, which he has named *T. bivittata*. They are, however, most probably only varieties; at least Cuvier states, in his 'Ossemens Fossiles,' that, however these animals may vary in colour, they present no difference in their proportions, nor in the details of their skeletons, though he has rigidly compared them together. Azara tells us that he once found dead a cagouaré thirty-seven inches and three-quarters long, which was of an universal yellowish white; whence he concludes that the perfect livery is not gained until the second year. The young are of an universal pale cinnamon colour.

In its manners the tamandua agrees with the tamanoir, with this difference, that it often climbs trees, aiding itself by its prehensile tail, which, however, is much inferior as a prehensile organ to that of the little two-toed ant-eater, and its claws are also less calculated for arboreal habits. Azara suspects that it feeds much upon honey and bees, which, he adds, are here (in Paraguay) destitute of stings, and take up their abode in trees. When reposing, the tamandua doubles its head on its chest, lies on its belly, places its fore-limbs along its sides and its tail over its body. It smells strongly of musk, and the odour, when the animal is irritated, is very disagreeable, and may be perceived at a great distance. The female produces one at a birth; it is, says Azara, very ugly, and is carried by the mother on her shoulders.

THE LITTLE ANT-EATER

(*Myrmecophaga didactyla*, Linn.).

The distinguishing characters of this species consist



142.—Little Ant-eater.

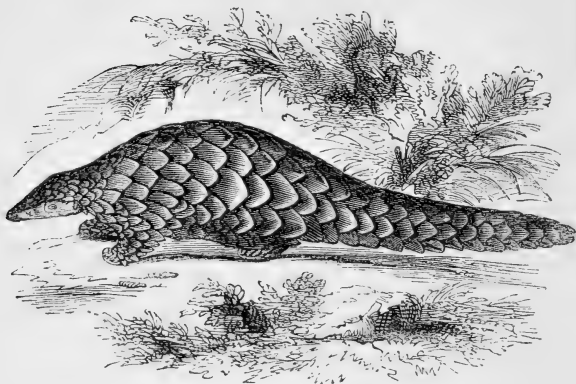
in the shortness of the muzzle, which is conical ; in the number of the claws, which are two on each fore-foot, of hook-like shape, compressed laterally and very sharp, the outer one being considerably the largest ; in the oblique position of the hind-feet, which are armed with four short compressed claws ; and lastly in the strongly prehensile power of the tail, which is very long and covered with fine silky fur, like that of the body, except for three inches of the under surface at the tip, where, as in the spider-monkey, it is perfectly naked. The claws of the fore-feet, which resemble those of the sloth, are folded down on a callous pad, and with these the little creature can cling to a branch, while the inward tournure of the hind-limbs combines with the prehensile structure of the tail to fit it for its arboreal residence. It may be observed that the animal possesses clavicles, which do not exist in the great ant-eater, the tamandua, nor yet in the pangolins. The eyes are small, the ears close and buried in the fur ; the mouth is small, and the tongue long and vermiform. The fur is exquisitely fine, soft,

curled, and silky; the general colour is delicate golden straw, with a brownish mark on the back, often wanting. Length of head and body, ten inches; of the tail, ten inches and a half. (Fig. 142.)

The little ant-eater is a native of Guiana and Brazil, where it tenants the forests, suspending itself by its long tail, as well as clinging by means of its claws: it searches for insects among the fissures of the bark, and attacks the nests of wasps, the nymphæ of which it pulls out with its fore-claws or nippers, and eats them while it sits up like a squirrel. In defending themselves, these animals strike with both the fore-paws at once, and with considerable force. In their habits they are nocturnal, sleeping with the tail twisted round their perch. They utter no cry. The female is said to breed in the hollows of trees, making a bed of leaves, and producing one only at a birth. There is a pale variety, regarded by some as a distinct species.

Genus MANIS.

The American Ant-eaters are represented in India and Africa by the Pangolins, or Scaly Ant-eaters, which constitute the genus *Manis* of Linnæus. These singular animals may at once be known by the armour of dense horny scales, or triangular plates, overlapping each other, by which every part of the body, except the middle line of the under surface, is completely invested. The body is depressed, rounded above, long and low; the head is small and conical, the eyes are minute, there are no external ears, the mouth is small, and the tongue long and extensible; the tail is long and broad, and covered above and below with hard imbricated scales; the limbs are very short and thick, and mailed like the rest of the body; no distinct toes are apparent beyond the claws, which on the fore-feet are five in number, the three central ones being of enormous size, arched, thick, and bluntly pointed. The first and the last claw are very small. The large claws fold down on a thick coarse pad, as in the ant-eater, and the mode of progression in both cases is the same. The hind-feet have five short, thick,

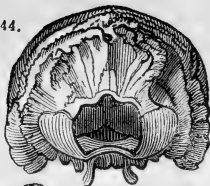


143.—Temminck's Manis.

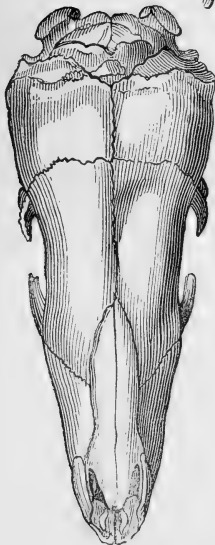
blunt claws, edging a pad-like sole covered with coarse granular skin, and so protuberant, that the claws do not fairly touch the ground. The ungual phalanges, or last joints of the toes (both of the fore and hind feet), which are sheathed by the claws, are remarkable for being bifurcated at their extremity, a peculiarity found in no other of the Edentata. It is evidently a conformation intended to give the claws a more secure attachment.

The osseous framework in general is moulded upon the same plan as that of the ant-eaters. Slow in their motions, and unfurnished with weapons of offence, the manis defies the assaults of almost every foe; when attacked, it rolls itself up into a ball, wraps its tail over the head, and raises all its pointed and sharp-edged scales in serried array, and, thus invulnerable, conquers by passive resistance. The food of the manis consists of termites and ants, which it takes in the same manner as the American ant-eaters. It dwells in holes which it burrows out in the ground.

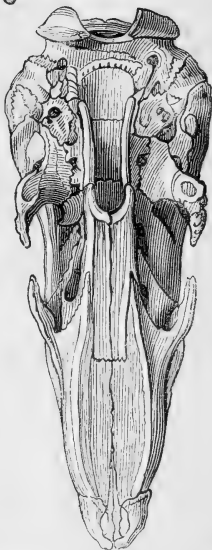
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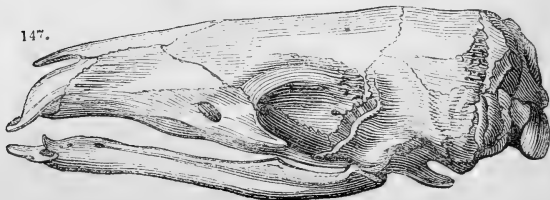
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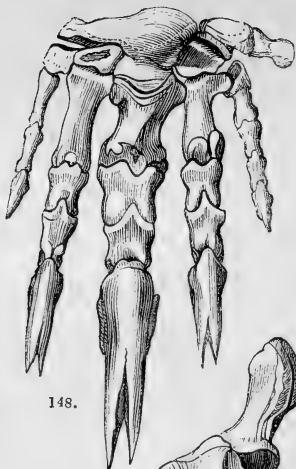


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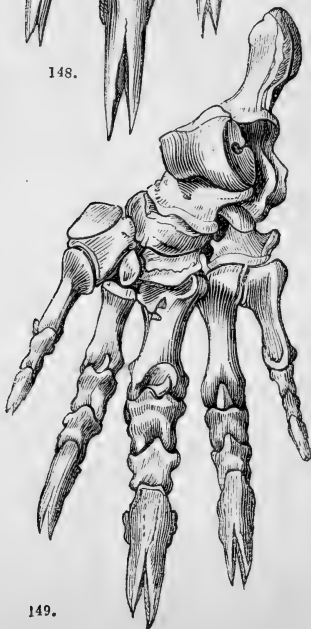


147.





148.



149.

THE SHORT-TAILED MANIS (*Manis brachyura*, Erxl.).

This species is a native of India, and is very common in the Dukhun, living on termite ants. The specimen before us measures about four feet in total length. A second Indian species is from Java; it is the *Manis Javanica* of Desmarest. A third species has recently been discovered by Mr. Hodgson in Nepâl.

THE LONG-TAILED MANIS

(*Manis longicaudata*, Geoffroy).

This is the best known of the African species, and attains to a large size, measuring about two feet in the length of the body, and about three feet in the length of the tail.

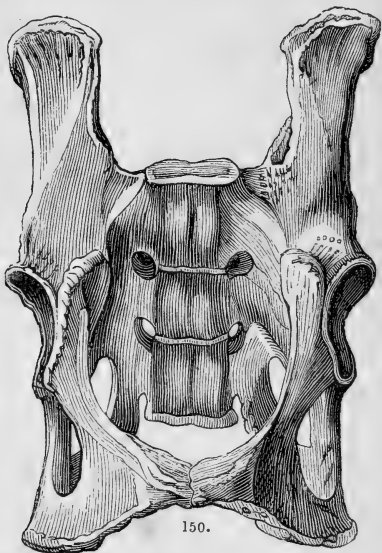
TEMMINCK'S MANIS (*Manis Temminckii*, Smuts).

The present pangolin is a native of South Africa. Mr. Bennett observes that the most remarkable features of this animal are the shortness of the head, the breadth of the body, and the breadth of the tail, which is nearly equal to that of the body, and continues throughout the greater part of its extent of nearly the same width, tapering only slightly towards the end, where it is rounded and almost truncate. (Fig. 143.) Mr. Bennett further remarks that a peculiarity in the distribution of the scales of *Manis Temminckii* is the cessation of the middle series of them at a short distance anterior to the extremity of the tail, so that the last four transverse rows consist of four scales each, each of the preceding rows having five. ('Zool. Proc.,' 1834.)

Habits, Food, &c.—Dr. Smith relates that, when *Manis Temminckii* is discovered, it never attempts to escape, but instantly rolls itself up into a globular form, taking especial care of its head, which is the only part that is easily injured. Ants constitute its chief and favourite food, and these it secures by extending its projectile tongue into holes which may exist in the habitations of these insects or which it may itself form; and when, by means of the glutinous matter with which its tongue is covered, a full load has been received, a sudden

retraction of the retractor muscles carries both into its mouth, after which the ants are immediately swallowed. ('Illustrations of the Zoology of South Africa.')

It is a rare species, the natives having a prejudice against it, and burning every individual they find, so



that it is almost extirpated in many places. Fig. 144 represents the posterior view of the skull of the short-tailed manis; Fig. 145, the skull seen from above; Fig. 146, ditto seen from below: Fig. 147, ditto profile; Fig. 148, the fore-foot; Fig. 149, the hind-foot; Fig. 150, the pelvis.







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